User Guide

Gigabit Server Network Interface Cards

3C996B-T and 3C996-SX

http://www.3com.com/
http://support.3com.com/registration/frontpg.pl

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1 Introduction

This guide describes how to install and configure the 3Com® Gigabit Server NICs in Windows XP, Windows 2000, Windows NT, Novell NetWare, Linux, UNIX, and, Solaris operating system environments.

Contents

- 3Com Gigabit Server NIC
  Keep the NIC in its package until ready for installation.
- *3Com Installation CD* with Gigabit Server driver software and online user guide.
- Quick start guide.

Inform your network supplier of any missing or damaged items. If you need to return the NIC, you must use the original (or equivalent) packaging.

Advanced Server Features Overview

The Advanced Server Features program is an intermediate software driver for Windows 2000 Server operating systems (Server, Advanced Server, and Datacenter Server), Windows NT Server operating systems (Server and Enterprise Server), NetWare, and Linux. The Advanced Server Features provide load balancing, failover, and VLAN configuration. These features are provided by creating teams (virtual NICs) that consist of multiple NICs. A team can consist of one to eight NICs, and each NIC can be designated primary or standby. All primary NICs in a team will participate in load balancing operations by sending and receiving a portion of the total traffic. Standby NICs will take over in the event that all primary NICs have lost their links. VLANs can be added to a team to allow multiple VLANs with different VLAN IDs. A virtual NIC is created for each VLAN added. Load balancing and failover features will work with any third-party NIC. VLANs work with 3Com, Broadcom, Alteon, and Intel NICs.

NOTE: Standby can be used only in load balance mode (see "Load Balance" below).

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Load Balance

Load balance is a protocol-specific scheme. The levels of support for IP, IPX, and other protocols are listed below.

Protocol	Load Balancing	Failover
IP	Yes	Yes
IPX	Yes*	Yes**
Other protocols	No	Yes**

*Only outbound load-balancing for IPX (on NetWare only).
**For 3Com NICs.

Load balance mode works with all Ethernet switches without configuring the switch ports to any special trunking mode. Only IP traffic will be load-balanced in both inbound and outbound directions. IPX traffic will be load-balanced in the outbound direction only. Other protocol packets will be sent and received through one primary NIC only. Failover for non-IP traffic is supported using 3Com,Broadcom,Alteon, and Intel NICs. The generic trunking mode requires the Ethernet switch to support some form of port trunking mode (for example, Cisco Systems Gigabit EtherChannel or other switch vendors' link aggregation mode). This mode is protocol-independent and all traffic should be load-balanced and fault-tolerant.

Advanced Server Features for Windows 2000

The following options are supported under Windows 2000 Server operating systems (Server, Advanced Server, Datacenter Server). See "Windows 2000 Driver Setup" on page 25 for additional information.

Failover and Load Balance

- Adapter teaming for failover (heterogeneous support for 3Com 10/100 server NICs, Alteon AceNIC, released Intel 10/100 server NICs, released Intel 1000BaseSX server NICs, and Intel 82559 LAN on Motherboard [LOM])
- Load balance
- Generic Link Aggregation (GEC/FEC, open trunk)
- Link aggregation (IEEE 802.3ad) static implementation only

Virtual LAN (VLANs)

- Up to 64 VLANs per team using IEEE 802.1Q-1988 tagging

Offloading

- IP, TCP/UDP checksum
- Support for segmentation of large TCP packets
- Jumbo frames (9K)

Power Management

- Remote Wake Up (magic packet, specific pattern)

NOTE: Wake-on-LAN (WOL) is not supported with the fiber version of the Gigabit Server NIC (3C996-SX). WOL must be disabled when using the fiber Gigabit Server NIC.

PCI Hot-Plug

- Microsoft

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Advanced Server Features for Windows NT

The following options are supported under Windows NT Server operating systems (Server and Enterprise Server). See "Windows NT Driver Setup" on page 37 for additional information.

Failover and Load Balance

- Adapter teaming for failover (heterogeneous support for 3Com 10/100 server NICs, released Alteon AceNIC, Intel 82559 LAN on Motherboard (LOM), released Intel 10/100 server NICs, and released Intel 1000BaseSX server NICs).
- Load balance
- Generic Link Aggregation (GEC/FEC, open trunk)
- Link aggregation (IEEE 802.3ad) static implementation only

Virtual LAN (VLANs)

- Up to 64 VLANs per team using IEEE 802.1Q-1988 tagging.

Offloading

- Jumbo frames (9K)

PCI Hot-Plug

- Contact your OEM for more information.

Advanced Server Features for Novell NetWare

The following options are supported under Novell NetWare. See "Novell NetWare Driver Setup" on page 51 for additional information.

Failover and Load Balance

- Adapter teaming for failover (heterogeneous support for 3Com 10/100 server NICs, Alteon Tigon2/3, Intel 82559 LAN on Motherboard (LOM), Intel 10/100 server NICs, and Intel 1000BaseSX server NICs).
- Load Balance
- Generic Link Aggregation (GEC/FEC, open trunk)

NESL Compliance

For optimal fault tolerance and recovery operations, BASP.LAN relies on the NIC drivers to generate NESL (NetWare Event Service Layer) events during link changes and other failure events. NESL is an optional feature in the ODI driver specification and not all drivers support it. For NESL events to propagate properly to BASP.LAN, ODINEB.NLM must be loaded before the NESL compliant ODI drivers.

Do the following to determine if a NIC driver supports NESL events:

- Load BASP.LAN and create a team by binding the NIC to the virtual slot (see instructions and examples below). In the Virtual Adapter X Team Members screen of the BASP.LAN menu interface, the Link status of all bound NICs are shown. Disconnect or connect the NIC cable. The link status shown on the screen should change immediately if the NIC driver supports NESL events.

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Virtual LAN (VLANs)

- Up to 64 VLANs per NIC using IEEE 802.1Q-1988 tagging (64 is the maximum configurable, although 32 is the maximum operable).

Offloading

- IP, TCP/UDP checksum—NetWare 5.0 or greater only

PCI Hot-Plug

- Contact your OEM for more information.

Advanced Server Features for Linux

The Gigabit Ethernet NIC supports the Linux driver. See "Linux Driver Setup" on page 65 for additional information.

- Packaging—The driver has been released in two packaging formats, source RPM and compressed TAR formats.
- Module Parameters—Optional parameters for the driver can be supplied as command-line arguments to the insmod command.
- Advanced Server Features—A kernel module designed for Linux 2.2 kernel that provides load balancing, failover, and VLAN features.

3Com Management Programs

The 3Com Management Programs is a graphical user interface that functions with the Windows 2000 Server operating systems (Server, Advanced Server, and Datacenter Server). See "3Com Management Programs" on page 85 for additional information. 3Com Management Programs have the following features:

- Vital Sign—The Vital Sign screen allows you to view vital NIC information, network status, and network connectivity. Active NICs are listed.
- Diagnostics—The Diagnostics screen allows you to view information and utilize functions to test this network interface card or LOM.
- Cable Analysis—From the Cable Analysis screen the user can monitor conditions of an Ethernet CAT5 cable connection within a cable plant in an Ethernet network. The software detects various cable conditions such as cable lengths between two given nodes, cable pair breakage, cable pair polarity, and data skew between cable pairs.
- Load Balance/Virtual LANs—The Load Balance/Virtual LANs screen allows you to configure advanced features. Any available NIC can be configured as part of a team.
- Statistics—The Statistics screen allows you view traffic statistics for most NICs. Statistical values and coverage are more comprehensive for some NICs than for others.

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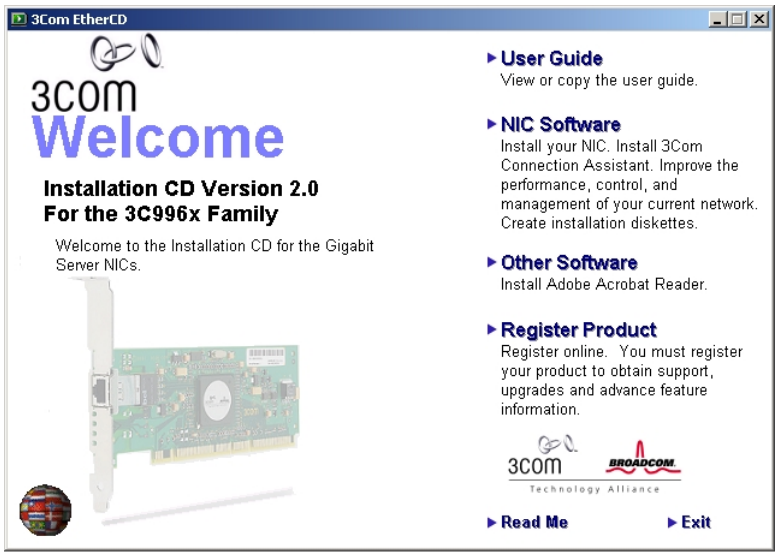
Creating a Driver Disk

Create driver disks using the MakeDisk utility (setup.exe file). This utility will allow you to create disks with the following drivers:

- Windows XP 32-bit Driver
- Windows XP 64-bit Driver
- Windows 2000 Driver
- Windows NT Driver
- NetWare Driver
- Advanced Server Features—Windows XP 64-bit Driver
- Advanced Server Features—Windows 2000 Driver
- Advanced Server Features—Windows NT Driver
- Advanced Server Features—NetWare Driver
- Advanced Server Features—Linux Driver

1. Insert the *3Com Installation CD* in the CD-ROM drive. Allow your operating system's autorun feature to launch the Master Navigator.


3Com EtherCD
3com
Welcome
Installation CD Version 2.0
For the 3C996x Family
Welcome to the Installation CD for the Gigabit Server NICs.
User Guide
View or copy the user guide.
NIC Software
Install your NIC. Install 3Com Connection Assistant. Improve the performance, control, and management of your current network. Create installation diskettes.
Other Software
Install Adobe Acrobat Reader.
Register Product
Register online. You must register your product to obtain support, upgrades and advance feature information.
3com
BROADCOM
Technology Alliance
Read Me
Exit

2. Click *NIC Software*.
3. Click *Installation Utilities*.
4. Click *Create Installation Diskette*.
5. In the Welcome window of the Diskette Creation Utility, click *Next*.
6. Insert a 3.5" disk into floppy drive A (default) or B. Click *Next*.
7. Follow the remaining Diskette Creation Utility commands and insert diskettes when prompted. When all driver diskettes have been created, the message "Diskette Copy Complete" appears on your screen.
8. Click *OK* to end the Diskette Creation Utility.
9. When all driver diskettes have been created, the information screen will appear, confirming that the drivers were successfully created. Click *OK*.

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2 Installing and Connecting the NIC

System Requirements

Before installing the Gigabit Ethernet NIC, be sure your system meets the requirements listed for your operating system.

Windows XP (64-bit)

- Itanium-based computer that meets Windows XP software requirements
- One open 32-bit or 64-bit PCI slot
- PCI v2.2 33/66 MHz or PCI-x v1.0 64 bit 133 MHz
- 256 MB RAM (minimum)
- Microsoft Windows XP (64-bit version)
- Gigabit Ethernet NIC driver software for Windows XP

Windows XP (32-bit)

- Pentium-based computer that meets Windows XP software requirements
- One open 32-bit or 64-bit PCI slot
- PCI v2.2 33/66 MHz or PCI-x v1.0 64 bit 133 MHz
- 128 MB RAM (minimum)
- Microsoft Windows XP (32-bit version)
- Gigabit Ethernet NIC driver software for Windows XP

Windows 2000

- Pentium-based computer that meets Windows 2000 software requirements
- One open 32-bit or 64-bit PCI slot
- PCI v2.2 33/66 MHz or PCI-x v1.0 64 bit 133 MHz
- 128 MB RAM (minimum)
- Microsoft Windows 2000 (Server, Advanced Server, or Datacenter Server)
- Gigabit Ethernet NIC driver software for Windows 2000:

Windows NT

- Pentium-based computer that meets Windows NT 4.0 software requirements
- One open 32-bit or 64-bit PCI slot
- PCI v2.2 33/66 MHz or PCI-x v1.0 64 bit 133 MHz
- 128 MB RAM (minimum)
- Microsoft Windows NT 4.0 (Server or Enterprise Server) with Service Pack 5 or later
- Gigabit Ethernet NIC driver software for Windows NT

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NetWare

- Pentium-based computer that meets Novell NetWare 4.2/5.x/6.x software requirements
- One open 32-bit or 64-bit PCI slot
- PCI v2.2 33/66 MHz or PCI-x v1.0 64 bit 133 MHz
- 128 MB RAM (minimum)
- One of the following versions of Novell NetWare:
  - Novell NetWare 5.0 or higher, with Support Pack 3 or the most recent NetWare 5 Support Pack
  - Novell NetWare 4.2 with Support Pack 7 or the most recent Support Pack, including the optional ODI v3.31 LAN drivers (MISC/ODI331).

    You can get the appropriate updates from the Novell support Web site
- Gigabit Ethernet NIC driver software for Novell NetWare. (Note that the server ODI driver can be found at the \netware\driver directory).

Linux

- Pentium-based computer that meets Linux software requirements
- One open 32-bit or 64-bit PCI slot
- PCI v2.2 33/66 MHz or PCI-x v1.0 64 bit 133 MHz
- 128 MB RAM (minimum)

NOTE: Although the driver should work with many Linux kernel versions and distributions, it has only been tested on RedHat 6.2 and 7 Linux distributions for i386 (kernel version 2.2.14 and 2.2.16), and the 2.4.0 test kernel. Furthermore, the driver has only been tested as a loadable module.

UNIX

- Pentium-based computer that meets corresponding UNIX software requirements
- One open 32-bit or 64-bit PCI slot
- PCI v2.2 33/66 MHz or PCI-x v1.0 64 bit 133 MHz
- 128MB RAM (minimum)

Solaris

- Pentium-based computer that meets Solaris 8 software requirements
- One open 32-bit or 64-bit PCI slot
- PCI v2.2 33/66 MHz or PCI-x v1.0 64 bit 133 MHz
- 128MB RAM (minimum)
- Solaris 8 operating system

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Safety Precautions

Observe the following safety precautions.

WARNING: The NIC is being installed in a system that operates with voltages that can be lethal. Before you remove the cover of your system, you must observe the following precautions to protect yourself and to prevent damage to the system components.

- Remove any metallic objects or jewelry from your hands and wrists.
- Use only insulated or nonconducting tools.
- Verify that the system is powered OFF and unplugged before removing the cover.
- Install or remove NICs only in a static-free environment. The use of a properly grounded wrist strap (or other personal anti-static device) and an anti-static mat are strongly recommended.

Pre-Installation Checklist

1. Check that your server meets the hardware and software requirements listed under "System Requirements" on page 7.
2. Verify that your system is using the latest BIOS.
3. Review the information in the release.txt file on the *3Com Installation CD* for important information not available at the time this manual was created.

NOTE: If you acquired the adapter software on a floppy disk or from a third-party support Web site, please check the appropriate source for the most recent information.

4. If your system is active, shut it down.
   - Under Windows 2000

     If Windows 2000 is currently running, close all applications and select *Start/Shut Down*. When the window appears, select *Shut Down* from the pull-down options, and click *OK*.
   - Under Windows NT

     If Windows NT is currently running, close all applications and select *Start/Shut Down*. Shut down the computer.
   - Under NetWare

     If Novell NetWare is currently running, use the *down* command (NetWare 5) or the *down* and *exit* commands (NetWare 4) at the server_name prompt to gracefully shut down the server functions and reach the DOS prompt:

     ```
     server_name: down
     server_name: exit
     ```
   - Under Linux

     If Redhat Linux is currently running, close all applications and at the command prompt type **`init 0`** to halt the machine. Once the machine is halted, you may have to turn off the power switch manually.
5. When system shut down is complete, turn the power off and unplug your system.
6. Holding the NIC card by the edges, remove it from its shipping package and place it on an anti-static surface.
7. Check the NIC for visible signs of damage, particularly on the edge connector. Never attempt to install any damaged NIC. If the NIC is damaged, report it to your supplier.

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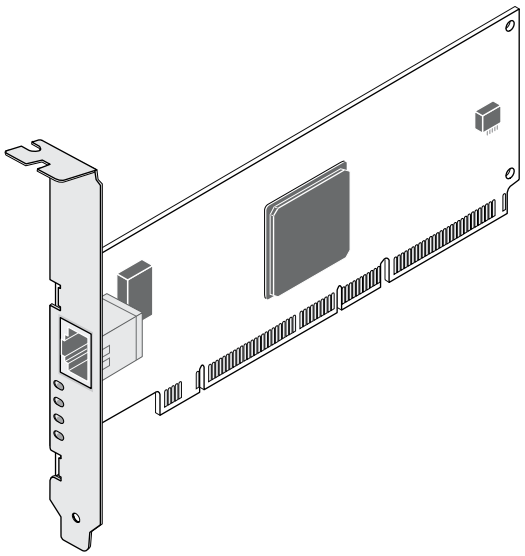
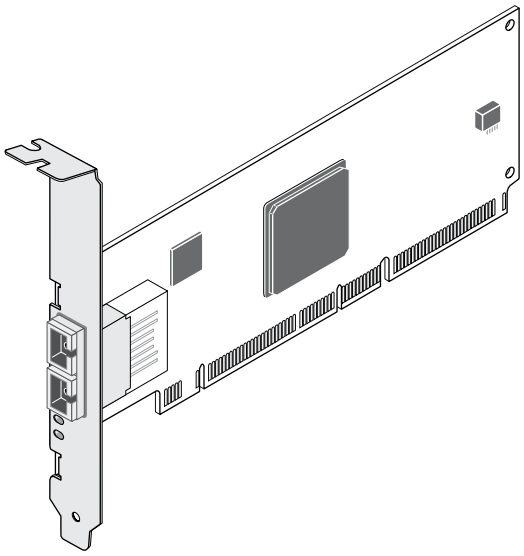
Installing and Connecting the NIC

This manual covers two types of Gigabit Server NICs: server Ethernet NIC (3C996B-T):



and server fiber NIC (3C996-SX):



The procedure for installing a NIC in a system is identical for both NICs. Connecting the network cables is different for Ethernet and fiber NICs (see "Connecting the Network Cables" on page 12).

Installing the NIC

1. Review the precautions and pre-installation instructions. Before installing the NIC, ensure the system power is off, the system is unplugged from the power outlet, and that proper electrical grounding procedures have been followed. Refer to the following figure to complete the remaining steps.
2. Remove the system cover, and select any empty PCI slot. If you do not know how to identify a PCI slot, refer to your system documentation.

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NOTE: For optimal performance, select a PCI-X slot. For second best performance, select a 64-bit PCI slot.

3 Remove the blank cover plate from the slot that you selected (see item 1 in the figure, below).

4 Holding the PCI card by the edges, align the NIC's connector edge with the PCI connector dock.

NOTE: The connector dock in a 32-bit PCI slot is shorter than in a 64-bit PCI slot. Although the NIC is designed to fit in either slot type, when installed in a 32-bit PCI slot, part of the NIC's connector edge will remain undocked. This is perfectly normal.

5 Applying even pressure at both corners of the card, push the NIC until it is firmly seated in the PCI slot. When properly seated, the NIC's port connectors will be aligned with the slot opening, and its faceplate will be flush against the system chassis.

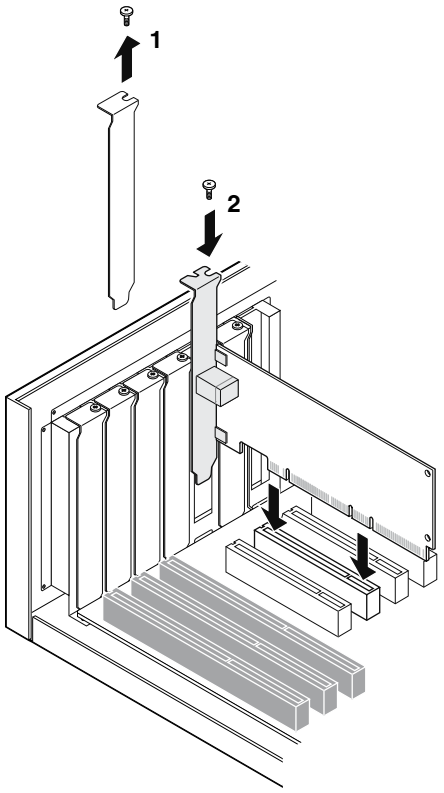
CAUTION: Do not use excessive force when seating the card, as this may damage the system or the NIC. If the card resists seating, remove it from the system, realign it, and try again.

6 Secure the NIC with the screw (see item 2 in the figure, below).

7 Replace the system cover and disconnect any personal anti-static devices.

8 Turn the system power on.

After the system returns to normal operation, the NIC hardware is fully installed. The next step is to connect the network cables.



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Connecting the Network Cables

Choose your type of NIC (Ethernet or fiber) and follow the procedure.

Ethernet NICs

Gigabit Ethernet NICs have one RJ-45 connector for attaching the system to an Ethernet copper-wire segment. When automatic link negotiation is disabled, the port can be configured for 10 Mbps or 100 Mbps signaling and either half-duplex or full-duplex operation. To configure the port for 1000 Mbps, both link partners must be configured for autonegotiation.

Follow this procedure for connecting a network cable to the Gigabit Ethernet NIC:

1 Prepare an appropriate cable. The following table lists the cable characteristics for connecting to 10/100/1000BASE-T ports:

Port Type	Connector	Media	Maximum Distance
10BASE-T	RJ-45	CAT 3, 4, or 5 UTP	100 meters (325 feet)
100BASE-T	RJ-45	CAT 5 UTP (two pair)	100 meters (325 feet)
1000BASE-T	RJ-45	CAT5 UTP (four pair)	100 meters (325 feet)

NOTE: 1000BASE-T signaling requires four twisted pairs of Category 5 balanced cabling, as specified in ISO/IEC 11801:1995 and EIA/TIA-568-A (1995) and tested using procedures defined in TIA/EIA TSB95.

2 Connect one end of the cable to the Gigabit Ethernet NIC.

3 Connect the other end of the cable to an RJ-45 Ethernet network port.

For driver installation and configuration instructions, refer to the software configuration for that specific driver.

After the NIC hardware and its driver software have been properly installed on your system, the LEDs indicate the following NIC states:

LED	State	Description
1000	On	Good Gigabit Ethernet link.
	Off	No 1000 Mbps link; possible link at different speed, possible bad cable, bad connector, or configuration mismatch.
100	On	Good 100 Mbps Fast Ethernet link.
	Off	No 100 Mbps link; possible link at different speed, possible bad cable, bad connector, or configuration mismatch.
10	On	Good 10 Mbps Fast Ethernet link.
	Off	No 10 Mbps link; possible link at different speed, possible bad cable, bad connector, or configuration mismatch.
ACT	Blinking	Brief bursts of data detected on the port.
	On	Streams of data detected on the port.
	Off	No data detected on the port.

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Fiber NIC

1. If you have not already done so, remove the optical dust cap from the NIC port.
2. Connect the NIC to the network using 62.5/125 µm or 50/125 µm mulitmode fiber-optic cable with SC duplex connectors.

Installing and Using the 3Com Connection Assistant

The 3Com Connection Assistant is an optional Web-based software component that allows users access to a variety of interactive technical support services.

These services can help you:

- Fix NIC installation problems.
- Fix network connection problems.
- Download the latest NIC drivers.
- Access a list of frequently asked questions as well as the 3Com Knowledgebase.

System Requirements

To install and use the 3Com Connection Assistant requires:

- Windows XP, Windows 2000, or Windows NT 4.0.
- Internet Explorer version 4.0 or later or Netscape Navigator version 4.06 or later.
- Microsoft Java Virtual Machine (JVM)

  See your PC documentation if you are unsure whether your PC is a Microsoft Java Virtual Machine (JVM).

Installation

1. Insert the *3Com Installation CD* in the CD-ROM drive.

   The Welcome screen appears. If not, double-click on *My Computer*, and then double-click on the CD-ROM drive icon to invoke the Welcome screen.
2. Click *NIC Software*.
3. Click *3Com Connection Assistant*.
4. Follow the prompts on the screen.

   A 3Com Connection Assistant icon appears on your Windows desktop. Double-click the icon to start the program.

   For help on using the 3Com Connection Assistant, see the online help included with the software.

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3 Windows XP Driver Setup

Installing the Driver Software

Before you begin software installation:

- Make sure that all software installation requirements are met. See "System Requirements" on page 7.
- Install the hardware. For instructions, see "Installing and Connecting the NIC" on page 7.

NOTE: Before beginning this procedure, verify that Windows XP has been upgraded to the latest version with the latest service pack applied.

NOTE: Make sure the correct BIOS and firmware are installed to ensure the system works correctly.

Windows XP 32-bit

Use the following procedure to install the driver for the first time in a system running Windows XP 32-bit version.

1. Start Windows and log in. You must have Network Administrator privileges to install the driver software
2. Insert the *3Com Installation CD* in the CD-ROM drive.
3. The main menu appears. Select *NIC Software*.
4. From the list on the left, select *NIC Drivers*.
5. Click *Install NIC Drivers*.
6. Click *Install Win XP 32 NIC Drivers*.
7. The Please Wait screen appears. After the installation is complete, and Update dialog box appears. Click *OK*.
8. The Choose Operating System screen appears. Click *Windows XP*.
9. Follow the steps in the Completing NIC Installation with Windows XP screen. After you are through, click *Done*. The drivers are installed.

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Windows XP 64-bit

Use the following procedure to install the driver for the first time in a computer running Windows XP 64-bit version.

1. Start Windows and log in. You must have Network Administrator privileges to install the driver software
2. Insert the *3Com Installation CD* in the CD-ROM drive.
3. The main menu appears. Select *NIC Software*.
4. From the list on the left, select *NIC Drivers*.
5. Click *Install NIC Drivers*.
6. Click *Install Win XP 64 NIC Drivers*.
7. The Please Wait screen appears. After the installation is complete, and Update dialog box appears. Click *OK*.
8. The Choose Operating System screen appears. Click *Windows XP.*
9. Follow the steps in the Completing NIC Installation with Windows XP screen. After you are through, click *Done*. The drivers are installed

Driver Installation Without Master Navigator

If you cannot use the 3Com Master Navigator on your system, use the following procedure to install the updated drivers.

1. Start Windows XP. The driver will be automatically installed.
2. Insert the *3Com Installation CD* in the CD-ROM drive. If the main menu appears, click *Exit*.
3. Select *Start/Control Panel/Network Connections*.
4. In the Network Connections window, right-click on the LAN or High-Speed Internet Connection icon corresponding to the NIC and select *Properties*.
5. Click *Configure*, then select *Driver.*
6. Click *Update Driver.*
7. Choose *Install from a list or specific location (Advanced)* and click *Next*.
8. Select *Don't search, I will choose the driver* and click *Next*.
9. Click *Have Disk*.
10. Click *Browse* and select the CD-ROM drive, then select OK.
11. Select the NIC and click *Next*. The driver will be copied to the hard disk.
12. Click *Finish.* The driver is installed.

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Verifying Successful Installation

1. Right-click *My Network Places* and select *Properties* from the menu.
2. Check connections in the LAN or High-Speed Internet window.

Modifying Configuration Parameters

Although the default values should be appropriate in most cases, you may change any of the available options to meet the requirements of your specific system. After the NIC driver software has been installed, use this procedure to verify or change the following NIC properties:

- 802.1p QOS
- Checksum Offload
- Flow Control
- Jumbo MTU
- Speed and Duplex
- Wake Up Capabilities

1. On the Desktop, right-click the *My Computer* icon and select *Properties* from the pop-up menu. The System Properties window displays.
2. Click the *Hardware* tab and then click *Device Manager*. The Device Manager window displays.
3. Scroll down the list of hardware devices to Network Adapters. Click the plus sign (+) to the left of the icon to display the list of NICs currently configured.
4. Double-click the Gigabit Ethernet NIC you want to configure. The Gigabit Ethernet Properties window displays, showing the General tab.
5. Select *Advanced*. A window showing the list of configurable properties (and default values) for the NIC displays.
6. Change the operating parameters as desired. To change NIC operating parameters listed under the Advanced tab, click the options listed under Properties and then use the pull-down window under Value to change the default or assigned value.

NOTE: When link negotiation is enabled, the user-configured link speed, flow control, and duplex settings are ignored in favor of automatically determined settings.

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The following options are available:

- 802.1p QOS
  - Disable (default)
  - Enable
- Checksum Offload
  - None
  - Rx TCP/IP Checksum
  - Tx TCP/IP Checksum
  - Tx/Rx TCP/IP Checksum
- Flow Control
  - Auto
  - Disable (default)
  - Rx PAUSE
  - Rx/Tx PAUSE
  - Tx PAUSE
- Jumbo MTU
  - 1500 (default)
  - 2000
  - 2500
  - 3000
  - 3500
  - 4000
  - 4500
  - 5000
  - 5500
  - 6000
  - 6500
  - 7000
  - 7500
  - 8000
  - 8500
  - 9000
- Speed and Duplex
  - 10 Mb Full
  - 10 Mb Half
  - 100 Mb Full
  - 100 Mb Half
  - Auto (default)
- Wake Up Capabilities
  - Both (default)
  - Magic Packet
  - None
  - Wake Up Frame

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7 When all desired configuration is complete, click *OK* to accept the settings.

8 Reloading your driver is recommended. To do so, right-click *My Network Places*.

9 Right-click the NIC and select *Disable*. You have unloaded the driver.

10 Right-click the NIC and select *Enable*. You have reloaded the driver.

11 Verify that the NIC port LEDs operate as described in the table in "Installing and Connecting the NIC" on page 7.

Removing the Driver Software

Windows XP automatically detects the installation of new hardware. However, Windows XP does not automatically detect removal of driver software. You must first uninstall the NIC driver before removing the NIC.

NOTE: If Advanced Server Features are installed, they must be uninstalled before removing the driver software. See "Uninstalling Advanced Server Features" on page 20 for details.

To remove the NIC driver and associated software, use the following procedure:

1 Start Windows XP system and log in. You must have Network Administrator privileges to uninstall the driver software.

2 Select *Start*, then *Control Panel*.

3 The Control Panel window appears. Double-click *Administrative Tools.*

4 Double-click *Computer Management*.

5 The Computer Management window appears. In the left-hand pane of the window, click on the "+" sign next to System Tools, and then click on *Device Manager.*

6 Click *Network adapters*, then right-click on the 3Com NIC.

7 Select *Uninstall*.

8 When the Confirm Device Removal window appears, click *OK*.

The driver and associated software are removed from your system.

NOTE: You must uninstall the driver before removing the NIC and moving it to a different slot.

Installing Advanced Server Features

NOTE: Advanced Server Features will only install on systems running Windows XP I64 Server Edition.

1 Start Windows XP I64 Server Edition and log in. You must have Network Administrator privileges to uninstall the driver software.

2 Insert the enclosed *3Com Installation CD* into the CD-ROM drive.

3 Select *Start/My Computer.*

4 Right-click CD-ROM drive, and select *Explore*. Do not select Autoplay.

5 Double-click *WinXP64* directory on the *3Com Installation CD*.

6 Double-click *BcmServ* directory.

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7 Double-click *baspi64i.exe* to install Advanced Server Features.

This will install the Advanced Server Features software and display a window.

From this menu, you can create a team. See "Creating a Team and Assigning NICs" on page 21, or click *OK* to complete installation.

Uninstalling Advanced Server Features

1 Start Windows XP I64 Server Edition and log in. You must have Network Administrator privileges to uninstall the driver software.

2 Select *Start/Control Panel/Network Connections*.

3 Right-click any NIC and select *Properties*.

4 Click *Broadcom Advanced Server Features program driver*, and then click *Uninstall.*

5 A Warning screen appears. Click *Yes* to continue.

6 At the prompt, click *Yes* to restart.

Configuring Advanced Server Features

The Advanced Server Features provides load balancing, failover, and VLAN configuration by creating teams (virtual NICs) that consist of multiple NICs.

Configuring Teaming

NOTE: All teaming configurations can be optionally performed using the 3Com Management Programs. Refer to "3Com Management Programs" on page 85 for additional information.

Any available NIC can be configured as part of a team. Teaming is a method of grouping multiple NICs to a virtual NIC (bundling multiple NICs to look like a single NIC). The benefit of this approach is *load balancing*.

By selecting each of the available NICs, move each of them over to the Load Balance Members column. This "team" now appears as one NIC. Each member in the Load Balance Member list shares the traffic burden of all its members.

The Standby Member field is used to permit the selection of one team member to handle traffic, if all other members in the Load Balance Member list fail (failover). The selected Standby Member will not handle any traffic unless all Load Balance Members fail. When one load balance member (or more) is restored (fail-back), traffic will then be resumed by the restored team member(s).

Teaming configuration is optional. Before configuring Teaming, see the "NIC Teaming" in Key Protocols and Interfaces.

Configuring Teaming consists of the following tasks:

- Accessing the Advanced Server Features Driver Properties interface
- Creating teams
- Adding NICs to the teams
- Assigning IP addresses to the teams

Each of these tasks is described below, along with procedures describing how to delete NICs from a failover team and how to delete a team.

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Accessing the Advanced Server Features Driver Interface

Use this procedure to access the NIC properties for teaming configuration:

1. Click the *Start* menu, and then select *Settings/Control Panel*.
2. Select *Network and Dial-up Connections*, right-click *3Com Virtual NIC*, and then select *Broadcom Advanced Server Program Driver*.

   The Advanced Server Features window appears.

Interface components of the Advanced Server Features driver properties window are described below:

- Select or enter a team name.
  This entry field is used to select or enter a team name.
- Unassigned NICs

  This list displays all of the NICs that are available to be added to a team. Because each NIC can be added to only one team, the NIC is removed from this list after it has been assigned to a team.
- Team Type

  Load Balance and Failover: Load balancing
  FEC/GEC: Also known as general trunking. No standby NIC is allowed when this option is selected.
- Team members

  This list displays all NICs that belong to a selected team.
- Standby NICs

  This list displays the standby NIC selected for failover for a selected team.
- VLAN List

  This list displays all the VLANs that have been created for the selected team.

Creating a Team and Assigning NICs

A failover team comprises at least one primary NIC (a standby NIC is optional). Each NIC can belong to only one team. To configure a new failover team, access the Advanced Server Features Driver Properties window and perform the following steps:

1. Enter a team name in the "Select or enter a team name" entry field.
2. Click *Create Team*.

NOTE: All other NICs added to the team are reconfigured automatically to match the team configuration. When the basic configuration properties of a team are changed, this changes the configuration of all NICs in the team. However, when a NIC is removed from any failover teams, it will operate according to the parameters set for it before becoming a member of a failover team.

3. Add a NIC to the team.
   - In the Unassigned NICs list, select the NIC(s) that you want to add to the team created in the previous step. Move the selected NICs to the Team Members list box using the double arrows.
   - When you have finished configuring failover teams, click *OK* to accept the changes.

NOTE: At least one NIC must be displayed in the Team Members list box.

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4 If a team has no NICs assigned, you will be prompted to add a NIC or delete the team.

Click *OK*. When team has been correctly configured, one Virtual Team NIC driver will be created for each configured team and will appear along with the other NICs in the Local Area Connection Properties window. Click *OK*.

5 Configure the team IP address if necessary. Configure the IP address and any other necessary TCP/IP configuration for the team. Click *OK* when finished. If you are unsure as to how to configure the TCP/IP properties, consult your Microsoft documentation.

Removing a NIC from a Team

1 To remove an NIC from its assigned team, select the NIC in the Team Members list and then click the double left arrow. Click *OK*.

2 In the Local Area Connection Properties window, click *OK*.

The NIC will be removed from the team list and will reappear in the Unassigned NICs list.

Deleting a Team

1 To delete a configured failover team and release its assigned NICs, select any NIC in the team list, and then click *Delete Team*. Click *OK*.

2 In the Local Area Connection Properties window click *OK*.

The team and all its assigned NICs will be removed from the team list. The released NICs will reappear in the Unassigned NICs list.

NOTE: NICs that are part of a team inherit all the basic configuration properties of the team, including VLANs associated with the team. If you delete a team, any VLANs configured for that team will also be deleted.

Configuring VLANs

VLAN Configuration is optional. Before configuring VLANs, see "VLANs Overview" on page 102.

NOTE: NICs that are members of a team can also be configured to support VLANs; however, VLANs cannot be configured with foreign NICs.

When configuring VLANs for team NICs, note that any NIC or LOM that is a member of a team inherits the configuration of the primary NIC. When a NIC or LOM is removed from the team, however, its original configuration parameters are used.

By default, Ethernet NICs are configured with VLAN support disabled. Up to 64 VLANs can be defined for each team on your server. Configuring VLANs consists of the following tasks:

- Accessing the VLAN configuration interface.
- Adding VLAN(s) to the team(s). This includes assigning a unique identifier and name to each new VLAN.

Each of these tasks is described below, along with procedures describing how to delete VLANs or modify the properties of a configured VLAN.

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Accessing the Adapter VLAN Configuration Interface

Use this procedure to access the NIC properties for VLAN Configuration:

1. Click the *Start* menu, and then select *Settings*, *Control Panel*.
2. Double-click the Gigabit Ethernet NIC icon.

   The Advanced Server Features configuration window is displayed. If you do not see the Gigabit Ethernet NIC icon, you must install the 3Com Management Programs. For more information, see "3Com Management Programs" on page 85.

The Advanced Server Features configuration window lists the installed NICs and the VLANs configured for each team. Each VLAN is identified with a unique identifier number and name that will appear only in this window. Interface components of the VLAN Configuration window are described in detail below:

- VLAN List

  This list displays all VLANs that have been configured.
- Control Buttons

  There are two control buttons: Create VLAN and Delete VLAN. These buttons are used for creating and deleting VLANs.

Adding a VLAN

You can define up to 64 VLANs per team. To configure a new VLAN, follow these steps:

1. From the Advanced Server Features window, select the team to which you want to add a VLAN.
2. Enter a VLAN Name and VLAN ID, and then click *Create VLAN*.
3. When you have finished adding VLANs to this team, click *OK*.
4. In the Local Area Connection Properties window, click *OK*.

   A new virtual NIC is created for each VLAN.

NOTE: To maintain optimal NIC performance, your system should have 64 MB of system memory for each eight VLANs.

When adding VLANs to a single NIC, a one-NIC team must be created.

Deleting a VLAN

To delete a configured VLAN, follow these steps:

1. From the Advanced Server Features window, select the team from which you want to delete the VLAN, and then click *Delete VLAN*. The selected VLAN will be deleted from the VLAN list window.
2. When you have finished deleting VLANs, click *OK* to accept the changes.
3. Click *OK* at the Local Area Connection Properties window.

Advanced Server Control Suite

If you have installed the Broadcom Advanced Server Control Suite, all Load Balancing and VLAN configuration is done from the Advanced Server Control Suite window. You can access the Advanced Server Control Suite by installing 3Com Management Programs. See "3Com Management Programs" on page 85 from more details.

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4 Windows 2000 Driver Setup

Installing the Driver Software

Before you begin software installation:

- Make sure that all software installation requirements are met. See "System Requirements" on page 7.
- Install the hardware. For instructions, see "Installing and Connecting the NIC" on page 7.

NOTE: Before beginning this procedure, verify that Windows 2000 has been upgraded to the latest version with the latest service pack applied.

NOTE: Make sure the correct BIOS and firmware are installed to ensure the system works correctly.

Use the following procedure to install the driver for the first time in a system running Windows 2000.

1. Start Windows 2000 and log in. You must have Network Administrator privileges to install the driver software.

   The Windows 2000 Found New Hardware wizard detects the new NICs and begins the driver installation.
2. Insert the *3Com Installation CD* in the CD-ROM drive.
3. From the main menu, select *NIC Software*.
4. From the list on the left, click *NIC Drivers*.
5. Click *Install NIC Drivers*.
6. Click *Install Win 2000 NIC Drivers*.
7. The Please Wait screen appears. After the installation is completed, an Update dialog box appears. Click *OK*.
8. The Choose Operating System screen appears. Click *Windows 2000*.

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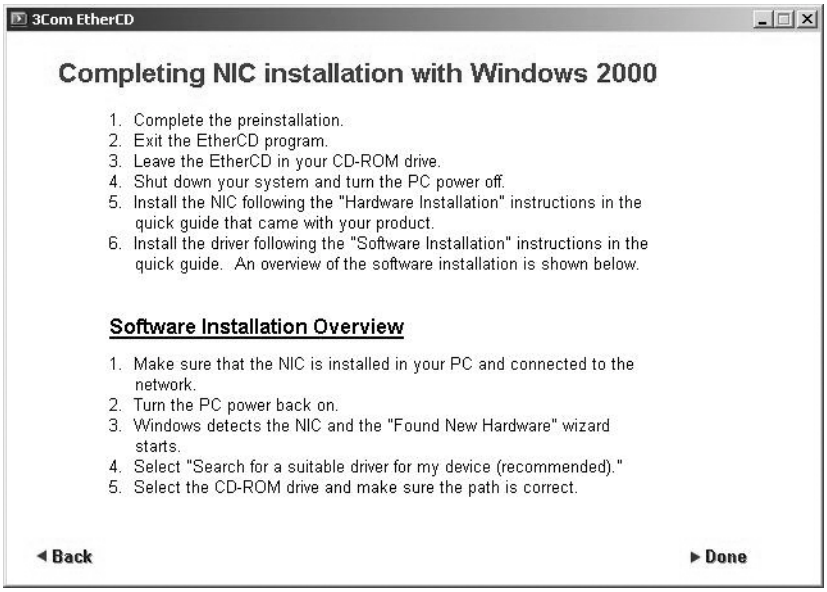
9 Follow the steps in the Completing NIC installation with Windows 2000 screen. Click *Done*.


3Com EtherCD
Completing NIC installation with Windows 2000
1. Complete the preinstallation.
2. Exit the EtherCD program.
3. Leave the EtherCD in your CD-ROM drive.
4. Shut down your system and turn the PC power off.
5. Install the NIC following the "Hardware Installation" instructions in the quick guide that came with your product.
6. Install the driver following the "Software Installation" instructions in the quick guide. An overview of the software installation is shown below.
Software Installation Overview
1. Make sure that the NIC is installed in your PC and connected to the network.
2. Turn the PC power back on.
3. Windows detects the NIC and the "Found New Hardware" wizard starts.
4. Select "Search for a suitable driver for my device (recommended)."
5. Select the CD-ROM drive and make sure the path is correct.
Back
Done

10 Click *Exit*.

11 Make sure the *3Com Installation CD* is still in the CD-ROM drive.

12 In the Found New Hardware Wizard screen, click *Next*.

13 The Install Hardware Device Drivers window appears. Click *Search for* a suitable driver for my device, and then click *Next*.

14 The Locate Driver Files screen appears. Select the CD-ROM drives checkbox, and then click *Next*.

15 The Driver Files Search Results screen appears. Verify that the correct path to the driver software is shown (c:\winnt\inf\oem0.inf), and then click *Next*. If you acquired the NIC software on a floppy disk or from the 3Com Web site, click where the NIC driver files reside on your system.

16 The Completing the Found New Hardware Wizard screen appears. Click *Finish*.

After installation of the driver software is complete, you are ready to configure NIC properties.

NOTE: After installing the drivers, it is recommended that you install the 3Com Management Programs to make full use of all management features. For more information, see "3Com Management Programs" on page 85.

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Verifying Successful Installation

1. Right-click *My Network Places* and select *Properties* from the menu.
2. Check connections in the Network and Dial-up Connections window.

Modifying Configuration Parameters

Although the default values should be appropriate in most cases, you may change any of the available options to meet the requirements of your specific system. After the NIC driver software has been installed, use this procedure to verify or change the following NIC properties:

- 802.1p QOS
- Checksum Offload
- Flow Control
- Jumbo MTU
- Speed and Duplex
- Wake Up Capabilities

1. On the Desktop, right-click the *My Computer* icon and select *Properties* from the pop-up menu. The System Properties window displays.
2. Click the *Hardware* tab and then click *Device Manager*. The Device Manager window displays.
3. Scroll down the list of hardware devices to Network Adapters. Click the plus sign (+) to the left of the icon to display the list of NICs currently configured.
4. Double-click the Gigabit Ethernet NIC you want to configure. The Gigabit Ethernet Properties window displays, showing the General tab.
5. Click the *Advanced* tab. A window showing the list of configurable properties (and default values) for the NIC displays.
6. Change the operating parameters as desired. To change NIC operating parameters listed under the Advanced tab, click the options listed under Properties and then use the pull-down window under Value to change the default or assigned value.

NOTE: When link negotiation is enabled, the user-configured link speed, flow control, and duplex settings are ignored in favor of automatically determined settings.

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The following options are available:

- 802.1p QOS
  - Disable (default)
  - Enable
- Checksum Offload
  - None
  - Rx TCP/IP Checksum
  - Tx TCP/IP Checksum
  - Tx/Rx TCP/IP Checksum
- Flow Control
  - Auto
  - Disable (default)
  - Rx PAUSE
  - Rx/Tx PAUSE
  - Tx PAUSE
- Jumbo MTU
  - 1500 (default)
  - 2000
  - 2500
  - 3000
  - 3500
  - 4000
  - 4500
  - 5000
  - 5500
  - 6000
  - 6500
  - 7000
  - 7500
  - 8000
  - 8500
  - 9000
- Speed and Duplex
  - 10 Mb Full
  - 10 Mb Half
  - 100 Mb Full
  - 100 Mb Half
  - Auto (default)
- Wake Up Capabilities
  - Both (default)
  - Magic Packet
  - None
  - Wake Up Frame

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7 When all desired configuration is complete, click *OK* to accept the settings.

8 Reloading your driver is recommended. To do so, right-click *My Network Places*.

9 Right-click the NIC and select *Disable*. You have unloaded the driver.

10 Right-click the NIC and select *Enable*. You have reloaded the driver.

11 Verify that the NIC port LEDs operate as described in the table in "Installing and Connecting the NIC" on page 7.

Removing the Driver Software

Windows 2000 automatically detects the installation of new hardware. However, Windows 2000 does not automatically detect removal of driver software. You must first uninstall the NIC driver before removing the NIC.

NOTE: If Advanced Server Features are installed, they must be uninstalled before removing the driver software. See "Uninstalling Advanced Server Features" on page 30 for details.

To remove the NIC, do the following:

1 Start Windows 2000 system and log in. You must have Network Administrator privileges to uninstall the driver software.

2 Open the Windows Start menu and select *Setting*, *Control Panel*:

3 The Control Panel window appears. Double-click *Add/remove Hardware Wizard*.

4 The Add/Remove Hardware Wizard window appears. Click *Next*.

5 The Choose a Hardware Task window appears. Click *Uninstall/Unplug a device* (recommended), and then click *Next*. Choose this option to uninstall a device or to prepare your computer for unplugging a device.

6 The Choose a Removal Task window appears. Click *Uninstall a device* (recommended), and then click *Next*. Choose this option to permanently uninstall a device and its driver.

7 The Installed Devices on Your Computer screen appears. Click the network adapter card you want to uninstall (3Com 3C996 10/100/1000 Server NIC), and then click *Next*.

8 In the Uninstalled Devices window, click *Yes, I want to uninstall this device*, and then click *Next*.

9 The Completing the Add/Remove Hardware Wizard window appears. Click *Finish*.

Now you can shut down your system and you can physically remove the NIC from the server.

NOTE: You must uninstall the driver before removing the NIC and moving it to a different slot.

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Installing Advanced Server Features

NOTE: Advanced Server Features will only install in a system running a Windows 2000 Server operating system (Server, Advanced Server, or Datacenter Server).

1. Start Windows 2000 Server and log in. You must have Network Administrator privileges to install the driver software.
2. Insert the *3Com Installation CD* into the CD-ROM drive.
3. If the main menu appears, click *Exit*.
4. Double-click *My Computer* icon.
5. Right-click CD-ROM drive, and select *Explore*. Do not select Autoplay.
6. Double-click *Windows 2000* directory on the *3Com Installation CD*.
7. Double-click *BcmServ* directory.
8. Double-click *Baspinst.exe* to install Advanced Server Features.
   This will install the Advanced Server Features software and display a window.
   From this menu, you can create a team. See "Creating a Team and Assigning NICs" on page 31, or click *OK* to complete installation.

Uninstalling Advanced Server Features

1. Start Windows 2000 system and log in. You must have Network Administrator privileges to uninstall the driver software.
2. Select *Start/Settings/Control Panel/Network and Dial-up Connections*.
3. Right-click any NIC and select *Properties*.
4. Click *Broadcom Advanced Server Features program driver*, and then click *Uninstall.*
5. A Warning screen appears. Click *Yes* to continue.
6. At the prompt, click *Yes* to restart.

Configuring Advanced Server Features

The Advanced Server Features provides load balancing, failover, and VLAN configuration by creating teams (virtual NICs) that consist of multiple NICs.

Configuring Teaming

NOTE: All teaming configurations can be optionally performed using the 3Com Management Programs. Refer to "3Com Management Programs" on page 85 for additional information.

Any available NIC can be configured as part of a team. Teaming is a method of grouping multiple NICs to a virtual NIC (bundling multiple NICs to look like a single NIC). The benefit of this approach is *load balancing*.

By selecting each of the available NICs, move each of them over to the Load Balance Members column. This "team" now appears as one NIC. Each member in the Load Balance Member list shares the traffic burden of all its members.

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The Standby Member field is used to permit the selection of one team member to handle traffic, if all other members in the Load Balance Member list fail (failover). The selected Standby Member will not handle any traffic unless all Load Balance Members fail. When one load balance member (or more) is restored (fail-back), traffic will then be resumed by the restored team member(s).

Teaming configuration is optional. Before configuring Teaming, see the "NIC Teaming" in Key Protocols and Interfaces.

Configuring Teaming consists of the following tasks:

- Accessing the Advanced Server Features Driver Properties interface
- Creating teams
- Adding NICs to the teams
- Assigning IP addresses to the teams

Each of these tasks is described below, along with procedures describing how to delete NICs from a failover team and how to delete a team.

Accessing the Advanced Server Features Driver Interface

Use this procedure to access the NIC properties for teaming configuration:

1. Click the *Start* menu, and then select *Settings/Control Panel*.
2. Select *Network and Dial-up Connections*, right-click *3Com Virtual NIC*, and then select *Broadcom Advanced Server Program Driver*.

   The Advanced Server Features window appears.

Interface components of the Advanced Server Features driver properties window are described below:

- Select or enter a team name.
  This entry field is used to select or enter a team name.
- Unassigned NICs

  This list displays all of the Ethernet NICs that are available to be added to a team. Because each NIC can be added to only one team, the NIC is removed from this list after it has been assigned to a team.
- Team Type

  Load Balance and Failover: Load balancing
  FEC/GEC: Also known as general trunking. No standby NIC is allowed when this option is selected.
- Team members

  This list displays all NICs that belong to a selected team.
- Standby NICs

  This list displays the standby NIC selected for failover for a selected team.
- VLAN List

  This list displays all the VLANs that have been created for the selected team.

Creating a Team and Assigning NICs

A failover team comprises at least one primary NIC (a standby NIC is optional). Each NIC can belong to only one team. To configure a new failover team, access the Advanced Server Features Driver Properties window and perform the following steps:

1. Enter a team name in the "Select or enter a team name" entry field.
2. Click *Create Team*.

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NOTE: All other NICs added to the team are reconfigured automatically to match the team configuration. When the basic configuration properties of a team are changed, this changes the configuration of all NICs in the team. However, when a NIC is removed from any failover teams, it will operate according to the parameters set for it before becoming a member of a failover team.

3 Add a NIC to the team.

- In the Unassigned NICs list, select the NIC(s) that you want to add to the team created in the previous step. Move the selected NICs to the Team Members list box using the double arrows.
- When you have finished configuring failover teams, click *OK* to accept the changes.

NOTE: At least one NIC must be displayed in the Team Members list box.

4 If a team has no NICs assigned, you will be prompted to add a NIC or delete the team. Click *OK*. When team has been correctly configured, one Virtual Team NIC driver will be created for each configured team and will appear along with the other NICs in the Local Area Connection Properties window. Click *OK*.

5 Configure the team IP address if necessary. Configure the IP address and any other necessary TCP/IP configuration for the team. Click *OK* when finished. If you are unsure as to how to configure the TCP/IP properties, consult your Microsoft documentation.

Removing a NIC from a Team

1 To remove an NIC from its assigned team, select the NIC in the Team Members list and then click the double left arrow. Click *OK*.

2 In the Local Area Connection Properties window, click *OK*.

The NIC will be removed from the team list and will reappear in the Unassigned NICs list.

Deleting a Team

1 To delete a configured failover team and release its assigned NICs, select any NIC in the team list, and then click *Delete Team*. Click *OK*.

2 In the Local Area Connection Properties window click *OK*.

The team and all its assigned NICs will be removed from the team list. The released NICs will reappear in the Unassigned NICs list.

NOTE: NICs that are part of a team inherit all the basic configuration properties of the team, including VLANs associated with the team. If you delete a team, any VLANs configured for that team will also be deleted.

Configuring VLANs

VLAN Configuration is optional. Before configuring VLANs, see "VLANs Overview" on page 102.

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NOTE: NICs that are members of a team can also be configured to support VLANs; however, VLANs cannot be configured with foreign NICs.

When configuring VLANs for team NICs, note that any NIC or LOM that is a member of a team inherits the configuration of the primary NIC. When a NIC or LOM is removed from the team, however, its original configuration parameters are used.

By default, Ethernet NICs are configured with VLAN support disabled. Up to 64 VLANs can be defined for each team on your server. Configuring VLANs consists of the following tasks:

- Accessing the VLAN configuration interface.
- Adding VLAN(s) to the team(s). This includes assigning a unique identifier and name to each new VLAN.

Each of these tasks is described below, along with procedures describing how to delete VLANs or modify the properties of a configured VLAN.

Accessing the Adapter VLAN Configuration Interface

Use this procedure to access the NIC properties for VLAN Configuration:

1. Click the *Start* menu, and then select *Settings*, *Control Panel*.
2. Double-click the Gigabit Ethernet NIC icon.

   The Advanced Server Features configuration window is displayed. If you do not see the Gigabit Ethernet NIC icon, you must install the 3Com Management Programs. For more information, see "3Com Management Programs" on page 85.

The Advanced Server Features configuration window lists the installed NICs and the VLANs configured for each team. Each VLAN is identified with a unique identifier number and name that will appear only in this window. Interface components of the VLAN Configuration window are described in detail below:

- VLAN List

  This list displays all VLANs that have been configured.
- Control Buttons

  There are two control buttons: Create VLAN and Delete VLAN. These buttons are used for creating and deleting VLANs.

Adding a VLAN

You can define up to 64 VLANs per team. To configure a new VLAN, follow these steps:

1. From the Advanced Server Features window, select the team to which you want to add a VLAN.
2. Enter a VLAN Name and VLAN ID, and then click *Create VLAN*.
3. When you have finished adding VLANs to this team, click *OK*.
4. In the Local Area Connection Properties window, click *OK*.

   A new virtual NIC is created for each VLAN.

NOTE: To maintain optimal NIC performance, your system should have 64 MB of system memory for each eight VLANs.

When adding VLANs to a single NIC, a one-NIC team must be created.

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Deleting a VLAN

To delete a configured VLAN, follow these steps:

1. From the Advanced Server Features window, select the team from which you want to delete the VLAN, and then click *Delete VLAN*. The selected VLAN will be deleted from the VLAN list window.
2. When you have finished deleting VLANs, click *OK* to accept the changes.
3. Click *OK* at the Local Area Connection Properties window.

Advanced Server Control Suite

If you have installed the Broadcom Advanced Server Control Suite, all Load Balancing and VLAN configuration is done from the Advanced Server Control Suite window. You can access the Advanced Server Control Suite by installing 3Com Management Programs. See "3Com Management Programs" on page 85 from more details.

Updating Mini-port (Core) Drivers

If you plan to update your network drivers and you are using an Advanced Server Feature team, use the following procedures.

CAUTION: Failure to use the following procedure might result in loss of network connectivity before and after a system reboot.

1. Right-click *My Network Places* and choose *Properties*.
2. Open the properties for the virtual NIC.
3. Open the Internet Protocol (TCP/IP) properties.
4. Write down the IP address information, and then click *Cancel*.
5. Right-click the local area connection you wish to update, and then select *Properties*.
6. Click *Configure*.
7. Click the *Driver* tab, and then click *Update Driver*. Click *Next*.
8. Click *Display a list of the known drivers for the device so that I can choose a specific driver.* Click *Next*.
9. Click *Have Disk*.
10. Type the path to the updated driver, and then click *OK*.
    Example: `E:\`
11. Select the Gigabit Ethernet NIC, and then click *Next*.
12. Click *Next*, and then click *OK*.
13. Repeat steps 5 through 12 for each NIC you want to update.
14. In the last local area connection, open the Advanced Server Features driver properties.
15. Click *Save*.
16. Type the filename, and then click *OK* to save the team information to be used during a restore.
17. Select the team, and then click *Delete Team*. Click *OK*.
18. Click *OK* to make the changes.
19. Open the properties on a local area connection.

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20 Open the Advanced Server Features driver properties.

21 Click *Restore*.

22 Type the filename you used during the save. Click *OK*.

23 Click *OK* twice to make the changes.

24 The virtual NIC appears in the Network and Dialup Connections window. Open the properties for the virtual NIC.

25 Reset the IP address for the virtual NIC, and then click *OK* twice to bring up the team.

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5 Windows NT Driver Setup

Installing the Driver Software

Before you begin software installation:

- Make sure that all installation requirements are met. See "System Requirements" on page 7.
- Install the hardware. See "Installing and Connecting the NIC" on page 7.

NOTE: Make sure that the correct BIOS and Firmware are installed to ensure the system works correctly.

NOTE: Verify that your Windows NT system is upgraded with Service Pack 5 (or the latest service pack). If you attempt to install the driver on a new Windows NT system without Service Pack 5 (or the latest service pack), the installation may not be successful. (3Com has tested and supports only Service Pack 6a.)

Before installing a service pack, you must first install the MS Loopback Adapter driver. For information on how to install Microsoft Loopback driver and how to install Backup Domain Controller, see the release notes for Windows NT.

Use the following procedure to install the driver for the first time in a computer that is running Windows NT.

1. Start the Windows NT system and log in. You must have Network Administrator privileges to install the driver software.
2. Insert the *3Com Installation CD* in the CD-ROM drive.
3. From the Welcome screen, click *NIC Software*.
4. Click *NIC Drivers*.
5. Click *Install NIC Driver*.
6. The Gigabit Ethernet Controller screen appears. Click *Continue*. To change parameters, see "Modifying Configuration Parameters" on page 38.
7. The TCP/IP Properties window opens. Perform any necessary TCP/IP configuration and click OK when finished. For help configuring TCP/IP protocol, consult your Microsoft Windows NT 4.0 documentation
8. An update window appears. Click *OK*.
9. The Choose Operating System screen appears. Click *Windows NT*.
10. Read the steps in the Completing NIC installation with Windows NT screen. Click *Done*.

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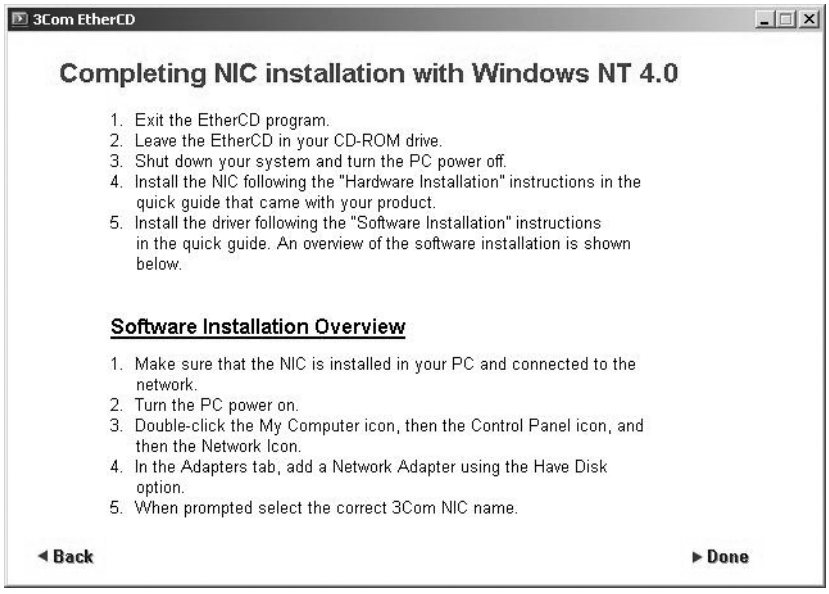
11 Click *Exit*, and then perform the steps outlined in Completing NIC installation with Windows NT screen.


3Com EtherCD
Completing NIC installation with Windows NT 4.0
1. Exit the EtherCD program.
2. Leave the EtherCD in your CD-ROM drive.
3. Shut down your system and turn the PC power off.
4. Install the NIC following the "Hardware Installation" instructions in the quick guide that came with your product.
5. Install the driver following the "Software Installation" instructions in the quick guide. An overview of the software installation is shown below.
Software Installation Overview
1. Make sure that the NIC is installed in your PC and connected to the network.
2. Turn the PC power on.
3. Double-click the My Computer icon, then the Control Panel icon, and then the Network Icon.
4. In the Adapters tab, add a Network Adapter using the Have Disk option.
5. When prompted select the correct 3Com NIC name.
Back
Done

12 When prompted to restart your computer, click *Yes*.

The system restarts, using the new configuration settings.

13 When the system returns to normal operation, verify that the NIC port LEDs operate as described in "Installing and Connecting the NIC" on page 7.

NOTE: After installing the drivers, it is recommended that you install the 3Com Management Programs to make full use of all management features. For more information, see "3Com Management Programs" on page 85.

Modifying Configuration Parameters

After the NIC driver software has been installed, you can change the configuration options at any time. The following NIC parameters are user-configurable:

- Basic properties: Flow Control, Speed and Duplex, and Jumbo MTU.
- Optional properties: Failover Team Configuration and VLAN Configuration.

NICs configured as part of a failover share basic configuration properties. Changing the configuration of one NIC in a specific team changes the properties of all the NICs in that team.

To access the NIC properties:

1 Open the Control Panel and double-click the *Network* icon.

2 When the Network window opens, select the *Adapters* tab.

The bus and slot number of the highlighted NIC are listed in the lower part of the window.

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3 Select the desired NIC from the Network Adapters window and click *Properties*.
The Gigabit Ethernet Controller window opens.
The possible NIC parameter types are:

- Flow Control
  - Disable (default)
  - Enable
- Speed and Duplex
  - Auto (default)
  - 10 Mb Half
  - 10 Mb Full
  - 100 Mb Half
  - 1000 Mb Full
- Jumbo MTU
  - 1500 (default)
  - 2000
  - 2500
  - 3000
  - 3500
  - 4000
  - 4500
  - 5000
  - 5500
  - 6500
  - 7000
  - 7500
  - 8000
  - 8500
  - 9000

4 When NIC parameter configuration is complete, click *OK* to accept the settings.

5 When prompted to restart your computer, click *Yes*.
The system restarts, using the new configuration settings.

6 When the system returns to proper operation, verify that the adapter port LEDs operate as described in the table in "Installing and Connecting the NIC" on page 7.

NOTE: If no configuration changes have been made, you can click *No* to close the configuration session without restarting your system.

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Updating the Driver Software

To replace version 4.0 NIC driver software with newer versions as they become available:

1. Start your Windows NT system and log in. You must have Network Administrator privileges to install the driver software.
2. Insert the *3Com Installation CD* in the CD-ROM drive.
3. From the Welcome screen, select *NIC Software*.
4. Click *Update NIC Driver*.
5. And Update screen appears. Click *OK*.
6. The Update NIC Drivers screen appears. Click *Done*.
7. Click *Exit*.
8. When prompted to restart your computer, click *Yes*. The system restarts using the new configuration settings.

Removing the Driver Software

You must uninstall the driver before removing a NIC or moving it to another slot in the server. To uninstall the driver software, do the following:

1. Start your Windows NT system and log in. You must have Network Administrator privileges to install the driver software.
2. Click the *Start* menu, and then select *Setting*, *Control Panel*.
3. The Control Panel screen opens. Double-click the *Network* icon
4. The Network window appears. Select the *Adapters* tab.
5. Click the NIC you want to uninstall, and then click *Remove*.
6. A "Do you still wish to continue" message appears. Click *Yes*.
7. In the Network Adapters screen, click *OK* to finish uninstalling the driver.
8. When prompted to restart your computer, click *Yes*. Now you can shut down your system, and then physically remove the network interface card from the PCI slot.

NOTE: You must uninstall the driver before removing a NIC or moving it to another slot in the server. When the driver software has been successfully uninstalled, you can shut down the system and remove the NIC from the PCI slot.

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Installing Advanced Server Features

These features are only available for Windows NT Server and Enterprise Server operating systems.

NOTE: If you have problems installing the Advanced Server Features, uninstall the Microsoft Loopback Adapter before installing the Advanced Server Features. If needed, you can reinstall the Microsoft Loopback Adapter afterwards. For more information see "Installing the Microsoft Loopback Adapter Driver" on page 46.

1. Start your Windows NT system and log in. You must have Network Administrator privileges to install the driver software.
2. Insert the enclosed *3Com Installation CD* into the CD-ROM drive.
3. From the Welcome screen, click *Exit.* You must exit the Master Navigator to install Advanced Server Features.
4. Click the *Start* menu, and then select *Settings*, *Control Panel*.
5. The Control Panel window appears. Double-click the *Network* icon.
6. In the Network window, click the *Protocols* tab.
7. Click *Add*.
8. The Select Network Protocol window appears. Click *Have Disk*.
9. The Insert Disk window appears. Type **`e:\WindowsNT\BcmServ\`** where "e" is the CD-ROM drive. Click *OK*.
10. The Select OEM Option window appears. Click *OK*.

    This will install the Advanced Server Features software and display a window.

    From this menu, you can create a team (see "Creating a Team and Assigning NICs" on page 42), or click *OK* to complete installation.
11. In the Network window, click *Close.*
12. When prompted to restart your computer, click *Yes*. After the system restarts, Advanced Server Features should be installed.

Uninstalling Advanced Server Features

1. Start your Windows NT system and log in. You must have Network Administrator privileges to install the driver software.
2. Click *Start*, and then select *Settings*, *Control Panel*.
3. Double-click the *Network* icon.
4. The Network window appears. Click the *Protocols* tab.
5. Select Advanced Server Features, and then click *Remove*.

NOTE: Before deleting Advanced Server Features, all teams and VLANs must be deleted.

6. A Warning screen appears. Click *Yes* to continue.
7. In the *Network* window, click *Close*.
8. When prompted to restart your computer, click *Yes*. When the system restarts, Advanced Server Features will be uninstalled.

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Configuring Teaming

Teaming configuration is optional. Before configuring Failover Teaming, see "NIC Teaming" on page 101.

Configuring Teaming consists of the following tasks:

- Accessing the Advanced Server Features Driver Properties
- Creating teams
- Adding NICs to the teams
- Assigning an IP address to the teams
- Rebooting the system

Each of these tasks is described below, along with how to delete NICs from a failover team and how to delete a team. For each procedure, you must log in as the Network Administrator.

Accessing the Advanced Server Features Driver Interface

1. Open the Control Panel and double-click the *Network* icon.
2. When the Network window opens, select the *Protocols* tab.
3. Select Advanced Server Features program driver, and then click *Properties*.
   The Advanced Server Features window is displayed.

   Interface components of the Advanced Server Features window are described below:

   - Select or enter a team name.

     (The entry field is used to select or enter a team name.)
   - Unassigned NICs
   - This list displays all of the Ethernet NICs that are available to be added to a team. Because each adapter can be added to only one team, the NIC is removed from this list after it has been assigned to a team.
   - Team Type

     Load Balance and Failover: Load balancing
     FEC/GEC: Also known as general trunking. No standby NIC is allowed when this option is selected.
   - Team members

     This list displays all NICs that belong to a selected team.
   - Standby NIC

     This list displays the standby NIC selected for failover belonging to a selected team.
   - VLAN List

     This list displays all the VLANs that have been created for the selected team.

Creating a Team and Assigning NICs

A failover team comprises at least one primary NIC and one standby NIC. Each NIC can belong to only one team. To configure a new team, access the Advanced Server Program Driver Properties window and do the following:

1. Enter a team name in the "Select or enter a team name" entry field.
2. Click *Create Team*.

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NOTE: All other NICs added to the team are reconfigured automatically to match the team configuration. When a basic team configuration properties are changed, this changes the configuration of all NICs in the team. However, after an NIC has been removed from any team, it will operate according to the parameters set for it before becoming a member of a team.

3 Add a NIC to the team.

- In the Unassigned NICs list, select the NIC(s) that you want to add to the team (created in the previous step). Move the selected NIC(s) to the Team members list box using the double arrows.
- When you have finished configuring failover teams, click *OK* to accept the changes.
- In the Network window, click *Close*.

NOTE: At least one NIC must be displayed in the Team Members list box. If a team has no NICs assigned, you will be prompted to add another NIC or delete the team.

4 The TCP/IP Properties window appears. Configure the Team IP address. Configure the IP address and any other necessary TCP/IP configuration for the team and click *OK* when finished. If you are unsure as to how to configure the TCP/IP properties, consult your Microsoft documentation.

5 When prompted to restart the system, click *Yes*. The system restarts, making the changes.

Removing NICs from a Team

1 To remove a NIC from its assigned team, select the NIC in the Team Members list and click the double left arrow. Click *OK*.

2 In the Network window, click *Close*.

3 When prompted to restart the system, click *Yes*.

The NIC will be removed from the team list and will reappear in the Unassigned NICs list.

Deleting a Team

1 To delete a configured failover team and release its assigned NICs, select the NIC in the team list, and then click *Delete Team*. Click *OK*.

2 In the Network window, click *Close*.

3 When prompted to restart the system, click *Yes*.

The team and all its assigned NICs will be removed from the team list. The released NICs will reappear in the Unassigned NICs list.

NOTE: NICs that are part of a team inherit all the basic configuration properties of the team, including VLANs associated with the team. If you delete a team, any VLANs configured for that team will also be deleted.

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Configuring VLANs

VLAN configuration is optional. Before configuring VLANs, see the "VLANs Overview" on page 102.

NOTE: NICs that are members of a team can also be configured to support VLANs. VLANs, however, cannot be configured for an Intel stand-alone LAN on Motherboard (LOM) or a team that includes a LOM.

When configuring VLANs for team NICs, note that any NIC or LAN-on-motherboard (LOM) that is a member of a team inherits the configuration of the primary NIC. However, when an NIC or LOM is removed from the team, its original configuration parameters are used.

By default, Gigabit Ethernet NICs are configured with VLAN support disabled. As many as 64 VLANs can be defined for each Gigabit Ethernet NIC on your server. Configuring VLANs consists of the following tasks:

- Accessing the VLAN configuration interface.
- Adding VLAN(s) to the NIC(s). This includes assigning a unique identifier and (optional) name to each new VLAN.
- Rebooting the system.

Each of these tasks is described below, along with how to delete VLANs or modify the properties of a configured VLAN.

Accessing the NIC VLAN Configuration Interface

1. Open your system Control Panel and double-click the *Network* icon.
2. When the Network window opens, select the *Protocols* tab.
3. Select the Advanced Server Features driver and click *Properties*. The Advanced Server Features window is displayed, from which you can configure VLANs.

The Advanced Server Features configuration window lists the installed NICs and the VLANs configured for each team, if any. Each VLAN is identified with a unique identifier number and name that will appear only in this window. Interface components of the VLAN Configuration window are described in detail below:

- VLAN List

  This list displays all VLANs that have been configured.
- Control Buttons

  There are two control buttons: *Create VLAN*, and *Delete VLAN*. These are used for creating and deleting VLANs.

Adding a VLAN

You can define as many as 64 VLANs per team. To configure a new VLAN, do the following:

1. From the Advanced Server Features window, select the team to which you want to add a VLAN.
2. Enter a VLAN Name and VLAN ID, then click *Create VLAN*.
3. When you have finished adding VLANs to this team, click *OK*.
4. In the Network window, click *Close*.

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5 The TCP/IP Properties window appears. Select the VLAN and configure TCP/IP settings. Click *Apply*. You must configure TCP/IP settings for each VLAN you created. When finished, click *OK*.

6 When prompted to restart the system, click *Yes*.

A new virtual NIC will be created for each VLAN.

NOTE: To maintain optimal NIC performance, your system should have 64 MB of system memory for each eight VLANs created.

Deleting a VLAN

NOTE: If you delete a team, any VLANs configured for that team will also be deleted.

NICs that are part of a team inherit all the basic configuration properties of the team, including VLANs associated with the team. If you delete a team, any VLANs configured for that team will also be deleted.

To delete a configured VLAN, do the following:

1 From the Advanced Server Features window, select the VLAN you want to delete and click *Delete VLAN*. The selected VLAN will be deleted from the VLAN list window.

2 When you have finished deleting VLANs, click *OK* to accept the changes.

3 In the Network window, click *Close*.

NOTE: If you delete all VLANs for a team, the TCP/IP Properties window appears. You must configure TCP/IP settings for the team. When finished, click *OK*.

4 When prompted to restart the system, click *Yes*.

NOTE: When VLANs are created and then deleted, the original team name and NIC assignments [Primary/Standby] are still present, but the IP address for the team is deleted.

Advanced Server Control Suite

If you have installed the Broadcom Advanced Server Control Suite, all Load Balancing and VLAN configuration is done from the Advanced Server Control Suite window. You can access the Advanced Server Control Suite by installing 3Com Management Programs. See “3Com Management Programs” on page 85 from more details.

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Installing the Microsoft Loopback Adapter Driver

When you do a fresh installation of Windows NT 4.0, Microsoft recommends that you install the Microsoft Loopback Adapter driver, and then verify that networking is operating normally before installing any NICs. The Loopback Adapter driver enables the computer to connect to local network resources that then allow alerter and messenger services to start on a stand-alone system.

Failure to install the Loopback Adapter driver before installing a service pack can result in a corrupted operating system. 3Com has tested and supports only Service Pack 6a. To install the driver, do the following:

1. Start the Windows NT 4.0 fresh installation and proceed as usual.
2. In the Windows NT 4.0 Server Setup window, click *Select from List*.
3. In the list, locate and select *MS Loopback Adapte*r and click *OK*.
4. In the Windows NT Server Setup window, click *Next*.
5. Bind protocols (TCP/IP, NetBEUI, or IPX/SPX) to the Loopback adapter driver, and then click *Next*.
6. Continue the installation as usual.
7. When prompted, click *Yes* to restart the computer.
8. Install the service pack.
9. When prompted, click *Yes* to restart the computer.
10. Install the 3Com Gigabit Ethernet NIC, its driver, and Advanced Server Features.
11. Bind protocols (TCP/IP, NetBEUI, or IPX/SPX) to the 3Com Gigabit Ethernet NIC driver.
12. When prompted, click *Yes* to restart the computer.

Performing a Fresh Installation of Windows NT on a Backup Domain Controller

CAUTION: If performed incorrectly, this procedure can destroy the primary domain controller security database. Before you proceed, back up your system.

A fresh installation of Windows NT on a backup domain controller requires the following:

- Installation of the NIC driver
- Network connectivity

  Because the NIC driver installation requires that the latest Microsoft service pack first be installed, and because there is no way to install a service pack during a Windows NT fresh installation on a backup domain controller, you must first set up two servers as primary domain controllers, and then demote one of them to a backup domain controller.

CAUTION: Do not use this procedure if SQL or Microsoft Exchange are on the primary domain controller that you wish to demote to a backup domain controller. If these items are on the primary domain controller, you must reinstall them after you finish this procedure.

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CAUTION: If performed incorrectly, this procedure can destroy the primary domain controller security database. Use the rdisk /s command to make emergency repair diskettes to backup the server security databases on the two servers before attempting this procedure.

1. Install Windows NT 4.0 with service pack 6a on two servers set up as primary domain controllers. (Follow the procedure in "Installing the MS Loopback Driver in Windows 4.0," above.)
2. Connect the two servers to the same network.
3. Create two domains in the same network. Set up the server and domain names.

   For example:

Server/Domain	Name
Server one	SERVER-1
Domain one	DOMAIN-1
Server two	SERVER-2
Domain two	DOMAIN-2

4. Place SERVER-1 in DOMAIN-1.
5. Place SERVER-2 in DOMAIN-2.
6. Set the same administrator password on both SERVER-1 and SERVER-2.
7. Setting up SERVER 1
8. Start Server Manager on DOMAIN-1\SERVER-1. From the Start menu, select *Programs/Administrative Tools (Common)/Server Manager*.
9. From the Computer menu, select *Add to Domain*.
10. Select *Windows NT Backup Domain Controller* as the computer type.
11. In the Computer Name field, enter the domain and server name. For example: DOMAIN-2\SERVER-2
12. Click *Add*.
13. Click *Close*.

Setting up SERVER 2

1. Start Server Manager on DOMAIN-2\SERVER-2. From the Start menu, select *Programs/Administrative Tools (Common)/Server Manager*.
2. From the Computer menu, select *Add to Domain*.
3. Select *Windows NT Backup Domain Controller* as the computer type.
4. In the Computer Name field, enter the domain and server name. For example: DOMAIN-1\SERVER-1
5. Click *Add*.
6. Click *Close*.

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Stopping the Net Logon Service on SERVER 1

1. Double-click the *Control Panel*.
2. Double-click *Services*.
3. In the Services dialog box, select *Net Logon*.
4. Click *Stop*.
5. Click *Yes* to stop the net logon service. This unlocks the security database.
6. Close the Services dialog box.

Stopping the Net Logon Service on SERVER 2

7. Double-click the *Control Panel*.
8. Double-click *Services*.
9. In the Services dialog box, select *Net Logon*.
10. Click *Stop*.
11. Click *Yes* to stop the net logon service
    This unlocks the security database.
12. Close the Services dialog box.

Renaming Domain-2/SERVER-2 to DOMAIN-1/SERVER-2

1. On SERVER-2, double-click the *Control Panel*.
2. Double-click *Network*.
3. In the Network dialog box, click the *Identification* tab.
4. Click *Change*.
5. In the Domain Name field, replace the name DOMAIN-2 with the name DOMAIN-1 and click *OK*. This process takes a few moments.
6. Click *Yes* to the Warning prompt.
7. In the Welcome to DOMAIN-1 domain dialog box, click *OK*.
8. Close the Network dialog box.
9. Click *No* at the prompt to restart the computer.
10. Establishing the Backup Domain Controller
11. Restart SERVER-1 and log in.
12. Restart SERVER-2, log in, and then wait for all services to start. Do not be alarmed if you receive a fail service message.
13. On SERVER-1, start Server Manager.
14. From the View menu, select *Refresh*. The Server Manager dialog box shows both SERVER-1 and SERVER-2 as PRIMARY controllers.
15. On SERVER-2, start Server Manager.
16. In the Server Manager dialog box, select *SERVER-1*.
17. From the Computer menu, select *Demote to Backup Domain Controller*, and then click *Yes*.

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18 On SERVER-1, refresh the Server Manager dialog box. From the View menu, select *Refresh*. The Server Manager dialog box now shows SERVER-2 as PRIMARY and SERVER-1 as BACKUP.

19 Select *SERVER-2*.

20 From the Computer menu, select *Synchronize with Primary Domain Controller*.

21 Click *Yes* to start synchronization.

22 Click *OK*.

23 Restart SERVER-1.

24 Restart SERVER-2.

25 Verify that services are starting correctly. If the backup domain controller begins to receive 7023 or 3210 errors after you synchronize the domains, correct the situation as follows:

   a On the primary domain controller, start Server Manager and select the backup domain controller.

   b Synchronize that specific backup domain controller with the primary domain controller.

   c After an event indicates that the synchronization is complete, restart the backup domain controller.

Updating Mini-port (Core) Drivers

If you plan to update your network drivers and you are using an Advanced Server Feature team, use the following procedures.

CAUTION: Failure to use the following procedure might result in loss of network connectivity before and after a system reboot.

1 Right-click *Network Neighborhood* and choose *Properties*.

2 Select the *Protocols* tab.

3 Open the TCP/IP Protocol properties.

4 Write down the IP address information for the virtual NIC, and then click *Cancel*.

5 Click the *Adapters* tab.

6 Highlight the network adapter, and then click *Update*.

7 Type the path to the updated driver, and then click *Continue*.
Example: `E:\`

8 Open the Advanced Server Features driver properties.

9 Click *Save*.

10 Type a filename to save the team information to be used during a restore, and then click *OK*.

11 Select a team, and then click *Delete Team*. Click *OK* to remove the team.

12 Click *Close*, and then click *Yes* to restart the computer.

13 After the machine restarts, right-click *Network Neighborhood* and choose *Properties*.

14 Select the *Protocols* tab.

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15 Open the Advanced Server Features driver properties.

16 Click *Restore*.

17 Type the filename you used during the save, and then click *OK*.

18 Click *OK* again to make the changes.

19 Click *Close* to reset the IP address on the virtual NIC.

20 When the machine prompts you to restart, click *Yes*.

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6 Novell NetWare Driver Setup

Pre-Installation Requirements

- The NIC must be installed in the server.
- Install the latest support pack files. The NetWare support pack or patch file(s) needed for your server operating system are indicated below:

NetWare OS	Support Pack or Patch	Files to be Installed
NetWare 5.1	NetWare 5.1 Support Pack (or latest support pack)	The latest support packs can be found at: **http://support.novell.com/misc/patlst.htm**
NetWare 4.2	Support Pack 8.0 or later	

NOTE: NetWare 5.x: If you are installing NetWare 5.x for the first time, you will need to install the NIC driver during the OS installation procedure. Install the NetWare 5 support pack after you have successfully installed the operating system on the server.

To obtain the latest support pack files, go to the Novell support Web site and select the Minimum Patch List option in the navigation bar. Scroll down the page and, using the table above as a guide, select and download the latest support pack or patch file(s) for the operating system running on your server.

NOTE: NetWare 4.2: The latest ODI LAN drivers are not installed automatically with the NetWare 4.2 Support Pack. Follow the support pack instructions for including the ODI LAN drivers during installation.

Installing Novell NetWare Server 4.2

1. When you install the operating system, select the custom method.
2. When you're asked if you would like to add startup commands, select *Yes*.
3. Enter the maximum and minimum packet receive buffers.

   The default maximum number of receive buffers for the system is 500; the default minimum is 128. Edit the startup.ncf file to have the following entries:

   ```
   SET MAXIMUM PACKET RECEIVE BUFFERS=10000
   SET MINIMUM PACKET RECEIVE BUFFERS=2000
   ```

4. When prompted for the network boards, select *Insert* to choose an unlisted driver.
5. Press *Enter* if the drivers are contained on a floppy disk, or press F3 and enter a different path.
6. Press Enter to select the network adapter.
7. Select *Modify Driver Properties* to configure the NIC's options, or select *Save and Load Driver*.

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8 Repeat steps 6 through 8 for additional NICs.

9 After you are finished configuring the NICs, select *Continue Installation*.

NOTE: You may want to change the autoexec.ncf file to add or delete keywords. The startup.ncf and autoexec.ncf files can be edited by invoking NWCONFIG from the NetWare 5.x server console, and by invoking LOAD INSTALL from the NetWare 4.x server console.

Example of a typical autoexec.ncf file:

```
file server name NOVELLSERVER41
# WARNING!
# If you change the name of this server, you must update
# all the licenses that are assigned to this server. Using
# NWAdmin, double-click a license object and click
# Certificate Assignments. If the old name of
# this server appears, you must delete it and then add the
# new server name. Do this for all license objects.
ServerID 1C8EE2C
LOAD ODINEB.NLM
LOAD TCPIP
LOAD B57 SLOT=2 FRAME=Ethernet_802.2 NAME=B57_1_E82
BIND IPX B57_1_E82 NET=FAFD3D25
LOAD B57 SLOT=2 FRAME=Ethernet_802.3 NAME=B57_1_E83
BIND IPX B57_1_E83 NET=5A2D8D6D
LOAD B57 SLOT=2 FRAME=Ethernet_SNAP NAME=B57_1_ESP
BIND IPX B57_1_ESP NET=477A35BD
LOAD B57 SLOT=2 FRAME=Ethernet_II NAME=B57_1_EII
BIND IPX B57_1_EII NET=C3C8F2E4
BIND IP B57_1_EII ADDR=172.16.1.1 MASK=ff.ff.ff.0
mount all
```

Configure the driver parameters, referring to the parameter descriptions found in the table below.

Parameter	Options	Description
CheckSum =	Default = ON Selections are: ON, OFF, Tx, Rx	Enables or disables the transmit and receive checksum off-loading feature. Note that checksum is supported under NetWare 5.x only.
Frame = type	Valid types are: Ethernet_802.2 Ethernet_802.3 Ethernet_II Ethernet_SNAP	Defines the frame type being used by this load instance. Ethernet_802.2 and Ethernet_II are the default values.
name = text		Name assigned to this NIC
PDrivers =	Default = OFF Selections are: OFF, ON	Allows driver to operate in persistent driver mode. Persistent driver mode is supported under NetWare 5.x only. Use only if adapter is placed in a Hot Plug PCI slot and only if required to swap with an exact board.
RxBuffers =	Default = 200 Min = 32 Max = 1000	Pre-allocates ECB resources on the adapter for receiving packets.

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Parameter	Options	Description
TxDescriptors =	Default = 120 Min = 100 Max = 400	Pre-allocates ECB resources on the adapter for transmitting packets.
RxFlow =	Default = ON Selections are: ON, OFF	Allows enabling/disabling of RxFlow control.
TxFlow =	Default = ON Selections are: ON, OFF	Allows enabling/disabling of TxFlow control.
Slot = n		Identifies the slot number for the specific BCM5700 adapter currently being configured. This parameter is not necessary if only a single adapter is installed.
Speed = n	Default is Auto. (Note that 1000 FD is only auto-detected at this time. AUTO, 10FD, 10HD, 100FD, 100HD	If link negotiation has been disabled, you can select port speed to be either Auto, 10HD or 10FD, 100HD or 100FD.
Link=	Default is FORCE because the speed keyword is usually used when a switch and the adapter speeds are both forced to a specific value. Selections are: AUTO, FORCE	Used only to allow the adapter to negotiate a specific or forced line speed with a switch that is not forced, but instead setup for auto-negotiation. It is best to allow for auto-negotiation of the card and switch by not setting this keyword or the speed keyword. Only use this keyword if the speed keyword is set to something other than AUTO.
RxTicks=	Default is 75 Min=0, disabled Max=5000000, 5 seconds Units in microseconds	Enables the use of batching receives within a specific time period.
TxPacketsPer=	Default is disabled Min=0 Max=100	Enables the use of batching transmits to a specific amount of packets.
Node Address=		To override the default Media Access COntroller (MAC) address (also known as the Locally Administered Address), specify a node address in this field. The expected range is 0060CD000000 through 0060CFFFFFFF.

NOTE: If you modify any NIC parameters, you must reboot the system before changes take effect. If you make changes and do not reboot, you may experience configuration problems. If the driver was loaded at console, however, no reboot is necessary.

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Installing Novell NetWare Server 5.1

Be sure that the server has the latest support pack available installed. The latest support packs can be found at:

http://support.novell.com/misc/patlst.htm.

You may want to create an archive disk by copying all the files from the CDROM\NetWare\Driver directory onto a floppy disk. If you choose to use the CD directly, ensure that the CDROM.NLM is loaded and that you are aware of the NetWare Volume name for the CD that you just installed.

1. When prompted for the network boards, select the field and then press Enter.
2. Press Insert to specify a NIC.
3. Press Insert to specify an unlisted NIC.
4. Press Enter if the drivers are contained on a floppy disk, or press *F3* and enter a different path.
5. Press Enter to select the NIC.
6. Select *Modify Driver Properties* to configure the NIC's options, or choose *Return to Driver Summary*.
7. If necessary, select additional NICs and repeat steps 5 through 7.
8. After you are finished configuring the NICs, select *Continue Installation*.
9. Restart the server for the new configuration to take effect.

NOTE: The server must be restarted for the new configuration.

Verifying or Modifying NIC Parameters

When a NIC configuration is saved, the NetWare install program adds load and bind statements to the autoexec.ncf file. By accessing this file, you can verify the parameters configured for each NIC, modify them, or enter additional parameters.

NOTE: The Novell monitor program and the config command are also useful for verifying driver configuration. For information on how to use these programs, see the Utilities Reference in your Novell NetWare online documentation.

The parameters that can be defined in the load statements are described in the table in "Installing Novell NetWare Server 4.2" on page 51. A valid autoexec.ncf file is shown below. One set of load and bind commands (in bold) is shown for each frame type the NIC is configured to support.

```
set Time Zone = PST8PDT
set Daylight Savings Time Offset = 1
set Start Of Daylight Savings Time = (APRIL SUNDAY FIRST 2:00:00
AM)
set End Of Daylight Savings Time = (OCTOBER SUNDAY LAST 2:00:00
AM)
set Default Time Server Type = SINGLE
set Bindery Context = O=LAN

# WARNING!
file server name NOVELLSERVER51
```


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```
# WARNING!
# If you change the name of this server, you must update
# all the licenses that are assigned to this server. Using
# NWAdmin, double-click a license object and click
# Certificate Assignments. If the old name of
# this server appears, you must delete it and then add the
# new server name. Do this for all license objects.
ServerID 1C8EE2C
LOAD ODINEB.NLM
LOAD TCPIP
LOAD B57 SLOT=2 FRAME=Ethernet_802.2 NAME=B57_1_E82
BIND IPX B57_1_E82 NET=FAFD3D25
LOAD B57 SLOT=2 FRAME=Ethernet_802.3 NAME=B57_1_E83
BIND IPX B57_1_E83 NET=5A2D8D6D
LOAD B57 SLOT=2 FRAME=Ethernet_SNAP NAME=B57_1_ESP
BIND IPX B57_1_ESP NET=477A35BD
LOAD B57 SLOT=2 FRAME=Ethernet_II NAME=B57_1_EII
BIND IPX B57_1_EII NET=C3C8F2E4
BIND IP B57_1_EII ADDR=172.16.1.1 MASK=ff.ff.ff.0
```

mount all

```
SEARCH ADD SYS:\JAVA\BIN
SEARCH ADD SYS:\JAVA\NWGFX
```

NOTE: If you modify any NIC parameters, you must reboot the system before the changes will take effect. If you make changes and do not reboot, you may experience configuration problems. If the driver was loaded at console, however, no reboot is necessary.

Removing Drivers from Autoexec.ncf

To remove the drivers from the autoexec.ncf file, locate the Load and Bind command lines associated with the Broadcom driver and remark them out by inserting the # symbol at the beginning of each command line.

Example:

```
# LOAD B57 SLOT=2 FRAME=Ethernet_802.2 NAME=B57_1_E82
# BIND    IPX B57_1_E82 NET=FAFD3D25
# LOAD B57 SLOT=2 FRAME=Ethernet_802.3 NAME=B57_1_E83
# BIND IPX B57_1_E83 NET=5A2D8D6D
# LOAD B57 SLOT=2 FRAME=Ethernet_SNAP NAME=B57_1_ESP
# BIND IPX B57_1_ESP NET=477A35BD
# LOAD B57 SLOT=2 FRAME=Ethernet_II NAME=B57_1_EII
# BIND IPX B57_1_EII NET=C3C8F2E4
# BIND IP B57_1_EII ADDR=172.16.1.1 MASK=ff.ff.ff.0
```


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Installing Advanced Server Features

1. Load BASP.LAN just like a standard LAN driver with the same frame types loaded for the NIC in the team. BASP.LAN requires a special VSLOT parameter to specify the virtual slot. The virtual slot can be viewed as a team number.

   Example:

   ```
   LOAD BASP.LAN FRAME=ETHERNET_II NAME=BASP_1_EII VSLOT=1
   ```

2. After BASP.LAN is successfully loaded, a new screen appears. This screen displays all virtual NIC settings and statistics. Press *Alt* + *Esc* to switch back to the console and continue with step 3.

3. Load the network drivers for the NIC that will be part of the team. The frame types loaded should be the same for all NICs in the team. Do not bind protocols directly to these NICs.

   Example:

   ```
   LOAD B57.LAN FRAME=ETHERNET_II NAME=B57_1_EII SLOT=1
   LOAD B57.LAN FRAME=ETHERNET_II NAME=B57_2_EII SLOT=3
   ```

4. Bind BASP.LAN to the NIC in the team by using a custom BASP BIND command at the console.

   Example:

   ```
   BASP BIND BASP_1_EII B57_1_EII
   BASP BIND BASP_1_EII B57_2_EII
   ```

   Note that if there are multiple frame types loaded on the virtual and the physical NICs, it is necessary to bind only one frame type on the virtual NIC to the same frame type on the physical NIC. The other frame types will be bound automatically.

5. Bind protocols to BASP.LAN.

   Example:

   ```
   BIND IP BASP_1_EII ADDR=x.x.x.x MASK=x.x.x.x
   ```

NOTE: Configuration of BASP.LAN should be performed manually by editing the AUTOEXEC.NCF file. NWCONFIG.NLM (or INSTALL.NLM) cannot completely configure BASP.LAN.

Uninstalling Advanced Server Features

To uninstall the Advanced Server Features, uninstall the NIC and the Advanced Server Features drivers.

To uninstall the NIC driver, type the following command at the Command Line Interface (CLI):

```
UNLOAD B57
```

The response will be:

```
B57 "Driver Name" unload
Module B57.LAN unloaded
```

To uninstall the Advanced Server Features driver, type the following command at the Command Line Interface (CLI):

```
UNLOAD BASP
```

The response will be:

```
Module BASP.LAN unloaded
```

NOTE: The Advanced Server Features program can not be unloaded if the NIC is bound to the Advanced Server Features program.

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Load Balance and Trunk Mode Selection

Use "MODE=SLB" for Load Balance mode or "MODE=TRUNK" for Generic Trunking mode. The default is load balance mode.

Example:

```
LOAD BASP.LAN FRAME=ETHERNET_II NAME=BASP_1_EII VSLOT=1 MODE=TRUNK
```

NOTE: Load Balance occurs only on the Tx send side with IPX protocol. It will not Load Balance on the receive side when running NetWare Advanced Server Features.

Loading Frame Types

After one or more NIC adapters are bound to a virtual adapter, additional frame types can only be loaded in the virtual adapter if the corresponding frame types are also loaded in the bound adapters. For example, ETHERNET_802.2 can be loaded in BASP VSLOT 1 if ETHERNET_802.2 is loaded for the B57 driver in SLOT 1 and 2 in the example below. Similarly, a virtual NIC can only be bound to a physical NIC if the physical NIC has all the frame types loaded in the virtual NIC.

Example:

```
LOAD BASP.LAN FRAME=ETHERNET_802.2 NAME=BASP_E82 VSLOT=1
LOAD B57.LAN FRAME=ETHERNET_802.2 NAME=B57_1_E82 SLOT=1
LOAD B57.LAN FRAME=ETHERNET_802.2 NAME=B57_2_E82 SLOT=2
```

Hot Standby

In Load Balance mode, one or more NIC can be designated as hot standby NICs. Use the keyword "STANDBY" in the BASP BIND command to indicate binding a NIC as a hot standby.

Example:

```
BASP BIND BASP_1_EII B57_1_EII
BASP BIND BASP_1_EII B57_2_EII STANDBY
```

In the above example, B57_1_EII and B57_2_EII are bound as primary and hot standby NICs respectively. Note that standby is valid only for load balance mode.

Configuring VLANs

NOTE: VLANs are not supported on all NICs. If a non-3Com NIC is a member of a failover team, VLANs may not be supported for that team.

To add VLANs to a team, do the following:

1. Load BASP.LAN with the same frame types as the NIC and specify one or more VLAN IDs. You can specify a maximum of 64 VLAN IDs.
   Example: (VLAN ID 2)
   ```
   LOAD BASP.LAN FRAME=ETHERNET_II NAME=BASP_1_V2_EII VSLOT=1
   VLAN=2
   ```
   Note that when VLAN is set to 0 (which is not a valid number) it will disable the VLAN feature.
   The valid range is 1–4094.
2. Load the network drivers for the NIC in the team with the frame types and VLANs specified.
   Example: (3Com NICs)
   ```
   LOAD B57.LAN FRAME=ETHERNET_II NAME=B57_1_EII SLOT=1
   LOAD B57.LAN FRAME=ETHERNET_II NAME=B57_2_EII SLOT=2
   ```


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3 Bind BASP.LAN to the NIC in the team for each protocol.

Example:

```
BASP BIND BASP_1_V2_EII B57_1_EII
BASP BIND BASP_1_V2_EII B57_2_EII
```

Note that if there are multiple VLANs (each with one or more frame types) loaded on the virtual NIC, it is necessary to bind only one frame type on one VLAN on the virtual NIC to the same frame type on the physical NIC. The other VLANs will be bound automatically.

4 Bind protocols to BASP.LAN.

Example:

```
BIND IP BASP_1_V2_EII ADDR=x.x.x.x MASK=x.x.x.x
```

This example creates a team with two NICs using VLAN ID 2. Outbound packets will be tagged with VLAN ID 2; only similarly tagged packets will be received by the NIC in the team. Additional VLANs with different VLAN IDs can be created in the same team. The maximum number of VLANs per virtual slot is 64. The valid range of VLAN IDs is 1–4094. VLAN=0 indicates the VLAN is untagged and is the default. Use decimal numbers to specify the VLAN ID.

The following are examples of multiple VLAN configurations:

```
LOAD BASP FRAME=ETHERNET_II NAME=BASP_1_V100_EII VSLOT=1
VLAN=100
LOAD BASP FRAME=ETHERNET_II NAME=BASP_1_V200_EII VSLOT=1
VLAN=200
LOAD BASP FRAME=ETHERNET_II NAME=BASP_1_V300_EII VSLOT=1
VLAN=300

LOAD B57 FRAME=ETHERNET_II NAME=B57_1_EII SLOT=1
LOAD B57 FRAME=ETHERNET_II NAME=B57_2_EII SLOT=4

BASP BIND BASP_1_V100_EII B57_1_EII
BASP BIND BASP_1_V100_EII B57_2_EII

BIND IP BASP_1_V100_EII ADDR=172.16.210.1 MASK=255.255.0.0
BIND IP BASP_1_V200_EII ADDR=172.17.210.1 MASK=255.255.0.0
BIND IP BASP_1_V300_EII ADDR=172.18.210.1 MASK=255.255.0.0
```

NOTE: When you execute BASP BIND BASP_1_V100_EII B57_1_EII, the NIC B57_1_EII is bound to all three VLANs.

NOTE: If you are unable to log in to the server after configuring Advanced Server Features, add the following command lines.

The following command lines should be in the autoexe.ncf file created to configure BASP:

```
UNLOAD SLPTCP
LOAD SLPTCP
```


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Additional Command Line Keywords

CHECKSUM=ON

This enables BASP.LAN to offload TCP/UDP and IP checksums to the bound NIC if supported. This will improve performance if some or all NIC in the team support hardware checksums.

Example:
A team of two BCM5700 NICs with hardware checksums enabled.

```
LOAD BASP.LAN FRAME=ETHERNET_II NAME=B57_1_EII CHECKSUM=ON
VSLOT=1
LOAD B57.LAN FRAME=ETHERNET_II NAME=B57_1_EII CHECKSUM=ON SLOT=1
LOAD B57.LAN FRAME=ETHERNET_II NAME=B57_2_EII CHECKSUM=ON SLOT=2
BASP BIND BASP_1_EII B57_1_EII
BASP BIND BASP_1_EII B57_2_EII
```

NOSCREEN

Disables the menu-driven screen when BASP.LAN is loaded for the first time.

Example:

```
LOAD BASP.LAN FRAME=ETHERNET_II NAME=BASP_1_EII VSLOT=1 NOSCREEN
```

GVRP

This enables GVRP (Garp VLAN Registration Protocol) for the VLAN that is loaded. An untagged 802.2 frame type must be loaded in the virtual NIC and all bound physical NICs for GVRP to take effect. This is necessary because GVRP uses untagged 802.2 frames to advertise VLAN memberships. Use VLAN=0 FRAME=ETHERNET_802.2 in the LOAD command to specify untagged 802.2 frame type.

Example:

```
LOAD BASP.LAN FRAME=ETHERNET_II NAME=BASP_1_V2_EII VSLOT=1 VLAN=2
GVRP
LOAD BASP.LAN FRAME=ETHERNET_802.2 NAME=BASP_1_V2_EII VSLOT=1
VLAN=0
```

Editing the AUTOEXEC.NCF File

When a NIC configuration is saved, the NetWare install program adds load and bind statements to the autoexec.ncf file. By accessing this file, you can verify the parameters configured for each NIC, add or delete parameters, or modify parameters.

Autoexec.ncf File Examples

A valid autoexec.ncf file is shown below. It includes one set of load and bind commands for each VLAN the NIC is configured to support. One load command (in bold) is entered for each NIC you want to add to a failover team.

Example 1:

```
set Time Zone = PST8PDT
set Daylight Savings Time Offset = 1:00:00
set Start Of Daylight Savings Time = (APRIL SUNDAY FIRST 2:00:00
AM)
set End Of Daylight Savings Time = (OCTOBER SUNDAY LAST 2:00:00
AM)
set Default Time Server Type = SINGLE
```


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```
# Note: The Time zone information mentioned above
# should always precede the SERVER name.
Set Bindery Context = 3Com

file server name GOBRCM
ipx internal net 1234ABCD

load conlog maximum=100
; Network driver LOADs and BINDs are initiated via
; INITSYS.NCF. The actual LOAD and BIND commands
; are contained in INITSYS.NCF and NETINFO.CFG.
; These files are in SYS:ETC.
#sys:etc\initsys.ncf

# Team of 2 NICs with frame type Ethernet_II and one VLAN,
number 2
# Load the network drivers for the NIC adapters in the team with
the frame
# types and VLANs specified.

#Load BASP.LAN with the same frame types and VLAN ID(s)
specified.

LOAD BASP.LAN FRAME=ETHERNET_II NAME=BASP_1_V2_EII VSLOT=1
VLAN=2

LOAD B57.LAN FRAME=ETHERNET_II NAME=B57_1_V2_EII SLOT=1
LOAD B57.LAN FRAME=ETHERNET_II NAME=B57_2_V2_EII SLOT=2

# Bind BASP.LAN to the NIC adapters in the team for each
protocol

BASP BIND BASP_1_V2_EII B57_1_V2_EII
BASP BIND BASP_1_V2_EII B57_2_V2_EII

#Bind protocols to BASP.LAN.

BIND IP BASP_1_V2_EII ADDR=192.168.2.200 MASK=255.255.255.0
```

Example 2:

```
# Team of 2 NICs with frame type Ethernet_II and three VLANs,
number 2,3,4

# Load the network drivers for the NIC adapters in the team with
the frame
# types and VLANs specified.

#Load BASP.LAN with the same frame types and VLAN ID(s)
specified.

LOAD BASP.LAN FRAME=ETHERNET_II NAME=BASP_1_V2_EII VSLOT=1
VLAN=2
LOAD BASP.LAN FRAME=ETHERNET_II NAME=BASP_1_V3_EII VSLOT=1
```


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```
VLAN=3
LOAD BASP.LAN FRAME=ETHERNET_II NAME=BASP_1_V4_EII VSLOT=1
VLAN=4

LOAD B57.LAN FRAME=ETHERNET_II NAME=B57_1_V_EII SLOT=1
LOAD B57.LAN FRAME=ETHERNET_II NAME=B57_2_V_EII SLOT=2

# Bind BASP.LAN to the NIC adapters in the team for each
protocol
# Note: BASP BIND is only used for the first VLAN all other
VLANs are automatically # bound to the virtual adapter
(VSLOT=1).

BASP BIND BASP_1_V2_EII B57_1_V_EII
BASP BIND BASP_1_V2_EII B57_2_V_EII

#Bind protocols to BASP.LAN.

BIND IP BASP_1_V2_EII ADDR=192.168.2.200 MASK=255.255.255.0
BIND IP BASP_1_V3_EII ADDR=192.168.3.200 MASK=255.255.255.0
BIND IP BASP_1_V4_EII ADDR=192.168.4.200 MASK=255.255.255.0

mount all
```

NOTE: If you modify any adapter parameters, you must reboot the system before the changes take effect. If you make changes and do not reboot, you may experience problems. If the driver was loaded at console, however, no reboot is necessary.

Example of Multiple SLB TEAMs with Multiple Frame Types:

```
LOAD BASP.LAN FRAME=ETHERNET_II NAME=BASP_1_EII VSLOT=1
LOAD BASP.LAN FRAME=ETHERNET_II NAME=BASP_2_EII VSLOT=2

LOAD BASP.LAN FRAME=ETHERNET_802.2 NAME=BASP_1_E82 VSLOT=1
LOAD BASP.LAN FRAME=ETHERNET_802.2 NAME=BASP_2_E82 VSLOT=2

LOAD B57.LAN FRAME=ETHERNET_II NAME=B57_1_EII SLOT=1
LOAD B57.LAN FRAME=ETHERNET_II NAME=B57_2_EII SLOT=2
LOAD B57.LAN FRAME=ETHERNET_II NAME=B57_3_EII SLOT=3
LOAD B57.LAN FRAME=ETHERNET_II NAME=B57_4_EII SLOT=4
LOAD B57.LAN FRAME=ETHERNET_802.2 NAME=B57_1_E82 SLOT=1
LOAD B57.LAN FRAME=ETHERNET_802.2 NAME=B57_2_E82 SLOT=2
LOAD B57.LAN FRAME=ETHERNET_802.2 NAME=B57_3_E82 SLOT=3
LOAD B57.LAN FRAME=ETHERNET_802.2 NAME=B57_4_E82 SLOT=4

BASP BIND BASP_1_EII B57_1_EII
BASP BIND BASP_1_EII B57_2_EII
BASP BIND BASP_2_EII B57_3_EII
BASP BIND BASP_2_EII B57_4_EII

BIND IP BASP_1_EII ADDR=172.16.3.50 MASK=255.255.0.0
BIND IPX BASP_1_E82 NET=ABAB
BIND IP BASP_2_EII ADDR=172.17.5.23
MASK=255.255.0.0 BIND IPX BASP_2_E82 NET=BEEF
```


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NOTE: Bind `B57_1_EII to BASP_1_E82` is also bound to BASP_1_E82. VLSOT range is from 1 to 4 (only four TEAMS can be configured.)

Example of VLAN with Advanced Server Features:

```
LOAD BASP.LAN FRAME=ETHERNET_II NAME=BASP_1_V100_EII VSLOT=1
VLAN=100
LOAD BASP.LAN FRAME=ETHERNET_II NAME=BASP_1_V100_EII VSLOT=1
VLAN=200
LOAD BASP.LAN FRAME=ETHERNET_II NAME=BASP_1_V100_EII VSLOT=1
VLAN=300

LOAD B57.LAN FRAME=ETHERNET_II NAME=B57_1_EII SLOT=1
LOAD B57.LAN FRAME=ETHERNET_II NAME=B57_1_EII SLOT=2

BASP BIND BASP_1_V100_EII B57_1_EII
BASP BIND BASP_1_V100_EII B57_1_EII

BIND IP BASP_1_V100_EII ADDR=172.16.210.1 MASK=255.255.0.0
BIND IP BASP_1_V200_EII ADDR=172.17.220.1 MASK=255.255.0.0
BIND IP BASP_1_V200_EII ADDR=172.18.230.1 MASK=255.255.0.0
```

NOTE: Bind `B57_1_V100_EII, B57_1_EII` are also bound to the other VLANs on the same VSLOT. VLAN refer to VLAN ID and valid VLAN ID ranges from 1 to 4096.

Example of TRUNKING with BASP:

```
LOAD BASP.LAN FRAME=ETHERNET_II NAME=BASP_1_EII VSLOT=1
MODE=TRUNK

LOAD B57.LAN FRAME=ETHERNET_II NAME=B57_1_EII SLOT=1
LOAD B57.LAN FRAME=ETHERNET_II NAME=B57_1_EII SLOT=2

BASP BIND BASP_1_EII B57_1_EII
BASP BIND BASP_1_EII B57_2_EII

BIND IP BASP_1_EII ADDR=172.16.210.1 MASK=255.255.0.0
```

NOTE: Switch ports must configure for Trunking (FEC or GEC-Cisco only).

Example of GVRP with BASP:

```
LOAD BASP.LAN FRAME=ETHERNET_II NAME=BASP_1_EII VSLOT=1
MODE=GVRP

LOAD B57.LAN FRAME=ETHERNET_II NAME=B57_1_EII SLOT=1
LOAD B57.LAN FRAME=ETHERNET_II NAME=B57_1_EII SLOT=2

BASP BIND BASP_1_EII B57_1_EII
BASP BIND BASP_1_EII B57_2_EII

BIND IP BASP_1_EII ADDR=172.16.210.1 MASK=255.255.0.0
```

NOTE: Switch ports must configure for GVRP.

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Installing Advanced Server Features on Novell NetWare Server 4.2 and 5.1

Use the following procedure to install Advanced Server Features on Novell NetWare Server 4.2 and 5.1:

1. Load BASP.LAN just like a standard LAN driver with the same frame types loaded for the NIC in the team. BASP.LAN requires a special VSLOT parameter to specify the virtual slot. The virtual slot can be viewed as a team number.

   Example:

   ```
   LOAD BASP.LAN FRAME=ETHERNET_II NAME=BASP_1_EII VSLOT=1
   ```

   After BASP.LAN is successfully loaded, a new screen appears. This screen displays all virtual NIC settings and statistics. Press *Alt* + *Esc* to switch back to the console and continue with step 2.

2. Load the network drivers for the NIC that will be part of the team. The frame types loaded should be the same for all NICs in the team. Do not bind protocols directly to these NICs.

   Example:

   ```
   LOAD B57.LAN FRAME=ETHERNET_II NAME=B57_1_EII SLOT=1
   LOAD B57.LAN FRAME=ETHERNET_II NAME=B57_2_EII SLOT=3
   ```

3. Bind BASP.LAN to the NIC in the team by using a custom BASP BIND command at the console (or in autoexec.inf).

   Example:

   ```
   BASP BIND BASP_1_EII B57_1_EII
   BASP BIND BASP_1_EII B57_2_EII
   ```

   Note that if there are multiple frame types loaded on the virtual and the physical NICs, it is necessary to bind only one frame type on the virtual NIC to the same frame type on the physical NIC. The other frame types will be bound automatically.

4. Bind protocols to BASP.LAN.

   Example:

   ```
   BIND IP BASP_1_EII ADDR=x.x.x.x MASK=x.x.x.x
   ```

NOTE: Configuration of BASP.LAN should be performed manually by editing the AUTOEXEC.NCF file. NWCONFIG.NLM (or INSTALL.NLM) cannot completely configure BASP.LAN.

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NIC Driver Configuration Parameters for Novell NetWare

Parameter	Options	Description
CheckSum =	Default = ON Selections are: ON, OFF, Tx, Rx	Enables or disables the transmit and receive checksum off-loading feature. Note that checksum is supported under NetWare 5.x only.
Frame = type	Valid types are: Ethernet_802.2 Ethernet_802.3 Ethernet_II Ethernet_SNAP	Defines the frame type being used by this load instance. Ethernet_802.2 and Ethernet_II are the default values.
name = text		Name assigned to this NIC
PDriver =	Default = OFF Selections are: OFF, ON	Allows driver to operate in persistent driver mode. Persistent driver mode is supported under NetWare 5.x only. Use only if NIC is placed in a Hot Plug PCI slot and only if required to swap with an exact NIC.
RxBuffers =	Default = 200 Min = 32 Max = 1000	Pre-allocates ECB resources on the adapter for receiving packets.
TxDescriptors =	Default = 120 Min = 100 Max = 400	Pre-allocates ECB resources on the adapter for transmitting packets.
RxFlow =	Default = ON Selections are: ON, OFF	Allows enabling and disabling of RxFlow control.
TxFlow =	Default = ON Selections are: ON, OFF	Allows enabling and disabling of TxFlow control.
Slot = n		Identifies the slot number for the specific BCM5700 NIC currently being configured. This parameter is not necessary if only a single NIC is installed.
Speed = n	Default is Auto. (Note that 1000 FD is only auto-detected at this time. AUTO, 10FD, 10HD, 100FD, 100HD	If link negotiation has been disabled, you can select port speed to be either Auto, 10HD or 10FD, 100HD or 100FD.
Link=	Default is FORCE because the speed keyword is usually used when a switch and the adapter speeds are both forced to a specific value. Selections are: AUTO, FORCE	Used only to allow the NIC to negotiate a specific or forced line speed with a switch that is not forced, but instead setup for auto-negotiation. It is best to allow for auto-negotiation of the NIC and switch by not setting this keyword or the speed keyword. Only use this keyword if the speed keyword is set to something other than AUTO.
RxTicks=	Default is 75 Min=0, disabled Max=5000000, 5 seconds Units in microseconds	Enables the use of batching receives within a specific time period.
TxPacketsPer=	Default is disabled Min=0 Max=100	Enables the use of batching transmits to a specific amount of packets.
Node=		To override the default media access control (MAC) address (also known as the Locally Administered Address), specify a node address in this field. The expected range is 0060CD000000 through 0060CFFFFFFF.

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7 Linux Driver Setup

Installation Overview

The driver is distributed in three packaging formats: binary RPM, source RPM, and compressed tar archive. The binary RPM includes precompiled driver modules for kernels 2.2.14-6.1.1 (Red Hat 6.2) and 2.2.16-22 (Red Hat 7.0), and is the preferred installation method for systems running these kernel versions. The source RPM is suitable for use on any system that has the RPM utility installed and a properly configured kernel source tree. The tar archive is made available for cases where the RPM utility is not installed.

NOTE: The following procedures require that you are logged on as "root" or equivalent.

Installing the Source RPM Package

1. To install the source RPM package, type:

   ```
   rpm -i bcm5700-<version>.src.rpm
   ```

2. CD to the RPM path and build the binary driver for your kernel:

   ```
   cd /usr/src/{redhat,OpenLinux,turbo, ..}
   rpm -bb SPECS/bcm5700.spec
   ```

   Note that the RPM path is different for different Linux distributions.

3. To install the newly built package, type:

   ```
   rpm -i RPMS/i386/bcm5700-<version>.i386.rpm
   ```

   The driver will be installed as /lib/modules/<kernel_version>/net/bcm5700.o.

4. To load the driver, type:

   ```
   insmod bcm5700
   ```

A newly installed Redhat 7's Enterprise kernel needs to be recompiled to regenerate versioned symbols before any newly compiled driver can load.

Building the Driver From a TAR File

1. Create a directory and extract the files:

   ```
   tar xvzf bcm5700-<version>.tar.gz
   ```

2. Change directory to src directory.

3. Build the driver bcm5700.o as a loadable module for both uniprocessor and multiprocessor systems:

   ```
   make
   ```

4. Test the driver by loading it:

   ```
   insmod bcm5700.o
   ```

5. Install the driver in /lib/modules/<kernel_version>/net:

   ```
   install -m 644 bcm5700.o /lib/modules/<kernel_version>/net
   ```

   Note that a newly installed Red Hat 7 Enterprise kernel needs to be recompiled to regenerate versioned symbols before any newly compiled driver can load.

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Patching PCI Files (Optional)

To use Red Hat's kudzu hardware detection utility, a number of files containing PCI vendor and device information need to be patched with information on the BCM5700 chip. A patch file (pci.patch) is included for Red Hat 7. Apply the patch by typing the following:

```
patch -N -pl -d /usr < pci.patch
```

To run kudzu, type:

```
kudzu
```

Unloading and Removing the Driver

1. Bring down all BCM5700 interfaces using ifconfig or ifdown:
   for example, **`ifdown eth0`**
2. Unload the driver:
   `rmmod bcm5700`
3. If the driver was installed using RPM, it can be removed using:
   `rpm -e bcm5700-<version>`

Optional Parameters

Optional parameters for the driver can be supplied as command line arguments to the insmod command. Commonly, these options are specified in a module configuration file: /etc/modules.conf or /etc/conf.modules. These parameters take the form:

```
<parameter>=value[,value,...]
```

where the multiple values for the same parameter are for multiple NICs installed in the system. All the parameters are listed below.

- line_speed

  Selects the line speed of the link. This parameter is used together with full_duplex to select the speed and duplex setting of the link. The valid values are:

0	Autonegotiate (default)
10	10 Mbps
100	100 Mbps

  Note that selecting 1000 Mbps manually is invalid. 1000 Mbps can only be achieved through autonegotiation.

- full_duplex

  Selects the duplexity of the link. This parameter is used together with line_speed to select the speed and duplex setting of the link. Note that this parameter is ignored if line_speed is 0. The valid values are:

0	half duplex
1	full duplex (default)

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- rx_flow_control

  Enables or disables receiving flow control (pause) frames. This parameter is used together with auto_flow_control. The valid values are:

0	pause receive disabled (default)
1	pause receive enabled if auto_flow_control is set to 0, or pause receive advertised if auto_flow_control is set to 1

- tx_flow_control

  Enables or disables transmitting flow control (pause) frames. This parameter is used together with auto_flow_control. The valid values are:

0	pause transmit disabled (default)
1	pause transmit enabled if auto_flow_control is set to 0, or pause transmit advertised if auto_flow_control is set to 1

- auto_flow_control

  Enables or disables auto-negotiation of flow control. This parameter is used together with rx_flow_control and TX_flow_control to determine the advertised flow control capability. The valid values are:

0	flow control auto-negotiation disabled (default)
1	flow control auto-negotiation enabled with capability specified in rx_flow_control and TX_flow_control (only valid if line_speed is set to 0)

- mtu

  Enables jumbo frames up to the specified MTU size. The valid range is from 1500 to 8184.

Advanced Server Features

The Advanced Server Features program is a kernel module designed for the Linux 2.2 kernel that provides load balancing, failover, and VLAN features. These features are provided by creating teams that consist of multiple NICs. A team can consist of 1 to 8 NICs and each NIC can be designated primary or standby. All primary NIC in a team will participate in load balancing operations by sending and receiving a portion of the total traffic. Standby NICs will take over in the event that all primary NICs have lost their links. VLANs can be added to a team to allow multiple VLANs with different VLAN IDs and a virtual device is created for each VLAN added.

Advanced Server Features program supports load balance and generic trunking. In load balance mode, all the NIC drivers must support NIC Extension (NICE). In this distribution, only 3Com NICs are supported. Load balance mode works with all Ethernet switches without configuring the switch ports to any special trunking mode. Only IP traffic will be load balanced in both inbound and outbound directions. The generic trunking mode does not require NICE and can work with any NIC, however, it requires the Ethernet switch to support link aggregation and be properly configured. This mode is protocol-independent and all traffic should be load balanced and fault tolerant.

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Installing Advanced Server Features

The driver is released in two packaging formats, source RPM and compressed tar archive. The file names for the two packages are bcm5700-<version>.src.rpm and bcm5700-<version>.tar.gz respectively. Identical files to build the driver are included in both packages.

Installing the TAR Archive

NOTE: Before installing the tar archive, copy the tar archive from the CD to a temp directory on your PC.

1. To uncompress and expand tar archive, run:

   `tar xvfz basplnx-{version}.tgz`

2. CD to the basplnx-{version} subdirectory:

   `cd basplnx-{version}`

To install the archive, perform the following:

1. Configure the major device number for Advanced Server Features configuration. The default major number is 254 and it can be changed by modifying "Makefile."

NOTE: Kernel sources must be installed and properly configured to build the driver.

2. To build kernel module "basp.o", type:

   `make`

   The Make process will automatically build the correct module for different kernel favors, e.g., symbol versioning and SMP support. There is NO need to define -DMODVERSIONS in the Makefile.

3. To create device file and to copy files, type:

   `make install`

4. To update the module reference, type:

   `depmod -a`

5. To load the driver, type:

   `insmod basp`

6. See "Configuring Teams" on page 69 to set up the teams.

Installing the RPM Package

1. To install RPM source package, run:

   `rpm -i basplnx-{version}.src.rpm`

2. CD to the RPM path and build the binary driver for the kernel:

   `cd /usr/src/{redhat, OpenLinux, turbo, ...}`
   `rpm -bb SPECS/basplnx.spec`

   The RPM path is different for different Linux distributions.

3. To install the newly built package, type:

   `rpm -i RPMS/i386/basplnx-{version}.i386.rpm`

   The driver and other required files will be installed.

4. To load the driver, type:

   `insmod basp`

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5 See "Configuring Teams" on page 69 to set up the teams.

Makefile	makefile
baspcfg	precompiled configuration utility
bcmtype.h	commonly use type header file
blf.c	Advanced Server Features module entry points
blf.h	ioctl interface
blfcore.h	core interface
blfcore.o	precompiled core object
blfopt.h	automatically generated header file from Make
blfver.h	version header file
nicext.h	NICE header file
pal.c	platform abstraction implementation
pal.h	header for platform abstraction
release.txt	this file
nice-2.2.16	contains NICE enabled driver sources code
scripts	contains sample scripts
scripts/basp	init script, goes to /etc/rc.d/init.d
scripts/baspteam	start/stop script, goes to /etc/basp
scripts/baspif	start/stop network, i/f, goes to /etc/basp
scripts/team-sample	sample script of SLB team with three NICs
scripts/team-gec	sample script of GEC team with three NICs

Configuring Teams

1 Copy a configuration script from "/etc/basp/samples" directory to "/etc/basp" directory.

The configuration script must be prefixed with "team-".

2 Modify the configuration script to:

- change the team type
- add/delete physical network interfaces
- add/delete virtual network interfaces

The syntax of the configuration script can be found below.

3 Manually start the team for the first time by typing:

```
/etc/rc.d/init.d/basp start
```

4 Run "netcfg" to configure the IP addresses of the virtual network interfaces.

If "netcfg" does not run, enter following command:

```
% ifconfig sw0 172.16.10.10 up
```

Consult ifconfig(8) for details in manually configuring a network interface.

NOTE: Starting the team is only required for the first time. Teams will be started automatically in subsequent reboots.

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NOTE: Forming multiple teams is possible by copying the sample files into "/etc/basp/" and modifying this file as described in the sample file. The files must have unique filenames. Name the files "team-xxx" where "xxx" is a unique identifier for the team.

NOTE: To create more that one virtual interface (VLAN) for each team, refer to the respective description section in the sample files.

BASPCFG Command Line Tool

The baspcfg command line tool is used to configure the Advanced Server Features teams, add and remove NICs, and add and remove virtual devices. The following is an example of the usage of this tool.

```
baspcfg v1.1.6 All rights reserved.
usage: baspcfg
```

commands

addteam <tid> <type> <tname>	create a team
delteam <tid>	delete a team
addva <tid> <vlan_id> <vname> [macaddr]	add a virtual adapter to a team
delva <tid> <vlan_id>	del a virtual adapter from a team bind
bind <tid> <role> <device>	bind a physical adapter to a team unbind
unbind <tid> <device>	unbind a physical adapter from a team
show <tid>	display team configurations

where

tid	A unique ID for each team, starting from 0
type	Team type: 0=SLB, 1=FEC/GEC
tname	ASCII string of the team
vlan_id	VLAN ID: from 1 to 4094, 0=untagged or no VLAN
vname	ASCII string of the virtual device
macaddr	MAC address (optional), e.g. 00:10:18:00:11:44
role	Role of the physical device: 0=primary, 1=hot-standby
device	ASCII string of the physical device, e.g. eth0

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Startup Scripts

1. basp

   This script is intended to be installed in /etc/rc.d/init.d directory. After copying the script, run "chkconfig --add basp". This script will be executed at runlevel 2, 3, 4 and 5. When basp runs, it will search the /etc/basp directory to list all the files with "team-" prefix, and then it will invoke the "baspteam" script to add or delete the teams. It is normal, for each "team-*" file in /etc/basp, to represent 1 team.

2. baspteam

   This script is called by basp to add or delete a team. To install, create "/etc/basp" directory and copy this script over.

   To manually add a team, type:

   `baspteam team-sample add`

   To delete a team, type:

   `baspteam team-sample del`

   Note that "team-sample" is the config script.

3. team-sample

   This script contains an SLB team configuration with three NICs: eth0, eth1 and eth2. The team name is "TeamSample". All three NICs are primary. One virtual interface is also created for this team and the name of the virtual interface is "sw0". "sw0" is the device that ifconfig should be run against to set up the IP address. No VLAN is enabled in the script.

   This script and "team-gec" are intended to be customized. Refer to the configuration scripts section for details. This script should be copied to /etc/basp directory and retain the "team-" prefix.

4. team-gec

   This configuration script creates a GEC team with 3 network interfaces: eth0, eth1 and eth2. The team name is "TeamGEC". All 3 NICs are primary. One virtual interface is added to the team with the name "sw0" and no VLAN is enabled.

   This script and the "team-sample" script are intended to be customized. Refer to the configuration scripts section for details. This script should be copied to /etc/basp directory and retain the "team-" prefix.

NOTE: Starting the team is only required for the first time. Teams will be started automatically in subsequent reboots.

NOTE: Forming multiple teams is possible by copying the sample files into "/etc/basp/" and modifying this file as described in the sample file. The files must have unique filenames. Name the files "team-xxx" where "xxx" is a unique identifier for the team.

NOTE: To create more that one virtual interface (VLAN) for each team, refer to the respective description section in the sample files.

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Configuration Scripts

Both team-sample and team-gec are configuration scripts that follow the same syntax, as follows:

- TEAM_ID: this number uniquely identifies a team.
- TEAM_TYPE: 0 = SLB, 1 = Generic Trunking/GEC/FEC
- TEAM_NAME: ascii name of the team
- TEAM_PAx_NAME: ASCII name of the physical interface x, where x can be 0 to 7.
- TEAM_PAx_ROLE: role of the physical interface x 0 = Primary, 1 = Hot-standby. This field must be 0 for Generic Trunking/GEC/FEC team.
- TEAM_VAx_NAME: ASCII name of the virtual interface x, where x can be 0 to 63
- TEAM_VAX_VLAN: 802.1p VLAN ID of the virtual interface x. For untagged virtual interface, i.e., without VLAN enable, set it to 0. The valid VLAN ID can be 0 to 4094.

NICE Patches

Also included in this distributions are network device drivers patched with NICE support. These drivers are originally taken from Linux 2.2.16 kernel distribution. To install patched drivers:

1. Copy the NICE header file, "nicext.h", to the Linux kernel include directory as follows:
   `cp /usr/src/basplnx-{version}/nicext.h user/src/linux/include/linux`
   where /usr/src is the temp directory you created when you installed the "Advanced Server Features" on page 67.
2. Rename the original network device driver under the Linux kernel source tree /usr/src/linux/drivers/net:
   `mv /usr/src/linux/drivers/net/3c59x.c /usr/src/linux/drivers/net/3c9x.orig`
3. Copy the patched drivers to the Linux kernel network driver source directory /usr/src/linux/drivers/net:
   `cp 3c59x.c /usr/src/linux/drivers/net/3c59x.c`
4. Follow the kernel rebuild instructions to configure kernel support of these drivers as follows:
   `CD /usr/src/linux`
   `make config`
5. If the patched drivers are configured into kernel, go to step 7. If the patched drivers are configured as module, go to step 6.
6. In the case of supporting only a module version of these drivers, it is possible to run the following steps to compile the patched driver, then install them into the proper module directory:
   `make modules`
   `make modules_install`
   There is no need to compile the complete kernel, go to step (8).
7. Rebuild the kernel to compile these patched drivers, as follows:
   `make dep`
   `make clean`
   `make bzImage`
8. Either reboot the system or unload/load the patched modules. Then run configuration scripts to test the patch.

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Removing the Driver and Team Configuration

To remove the RPM package, type:

```
rpm -e basplnx-{version}.386.rpm
```

To reboot the system, type:

```
reboot
```


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8 UNIX and SCO OpenServer Driver Setup

UnixWare 7 Driver

This procedure describes the installation procedure for the UnixWare 7 driver. The driver is released as a TAR file containing the set of object, configuration, and script files used to create the driver add-on package.

Package Creation

To create a package:

1. On a UnixWare system, create a directory for the package and copy the files on the installation CD to it.
2. Untar the TAR file using:
   `tar xvf bcme-<version>.tar`.
3. Create a package on a diskette, where the package can be installed on the same system or other systems, using:
   `pkgtrans -s <path> diskette1`
   where *<path>* is the directory where the TAR file was untarred in step 2.
4. Directly install the package on the same system, using:
   `pkgadd -d <path>`
   where *<path>* is the directory where the TAR file was untarred in step 2.

Driver Installation

To install the driver:

1. Install the *bcme* package created in step 3 of "Package Creation" using:
   `pkgadd -d diskette1`.
2. Add the new network adapter using either:
   `netcfg`
   or
   `scoadmin`.
3. When prompted, select the Line Speed and then select Advanced Option for Flow Control, MAC Address, and Jumbo MTU Size settings, if desired. The settings for these parameters are listed below:

Line Speed
AutoNegotiate (default)
HalfDuplex10
FullDuplex10
HalfDuplex 100
FullDuplex100

* 1000 Mbps (1 Gbps) full duplex fixed speed is only valid for fiber connections. For copper twisted-pair connections, 1 Gbps can only be set through autonegotiation with a 1 Gbps partner.

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Line Speed

FullDuplex1000*

* 1000 Mbps (1 Gbps) full duplex fixed speed is only valid for fiber connections. For copper twisted-pair connections, 1 Gbps can only be set through autonegotiation with a 1 Gbps partner.

Flow Control

Off (default)

AutoNegotiate (Symmetric Pause advertised)*

RxPause

TxPause

RxPause/TxPause

*Autonegotiation of Flow Control is only valid when the Line Speed is set to AutoNegotiate.

MAC Address

No Override (default) - a user-administered MAC address entered with a colon separating each hexadecimal byte (e.g., 12:34:56:78:9a:bc).

Jumbo MTU Size

1500 - 1900 (default is 1500).

SCO OpenServer Release 5 Driver

This procedure describes the installation of the SCO OpenServer Release 5 driver. This driver is released as a media image file containing the driver package. The media image file can be copied directly to the target machine, or from an installation diskette.

Installation Diskette

To create an installation diskette:

1. Copy the file *VOL.000.000* to an SCO system.
2. Create a diskette using:
   `dd if =VOL.000.000 of=/dev/rfd0135ds18`.

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Driver Installation

To install the driver:

1. Install the SCO OpenServer driver from the media image or installation diskette using either:
   `custom`
   or
   `scoadmin`.
2. Add the new network adapter using:
   `netconfig`.
3. Modify the hardware configuration in Advanced Options to change the Line Speed and Flow Control, if desired. The settings for these parameters are listed in step 3 of "Driver Installation" on page 75.

NOTE: A kernel relink and reboot is required before the new configuration will take effect.

Jumbo Frames and Other Advanced Parameters

Jumbo MTU sizes and other advanced tunable parameters for the BCM5700 controller are located in the file *space.c* in the directory */etc/conf/pack.d/bcme*. A description for each parameter is contained in space.c. Modify the desired parameter in space.c, rebuild the kernel, and reboot the system. Note that the MTU sizes can be individually set for each adapter in the system, whereas all other parameters apply globally to all adapters.

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9 Solaris Driver Setup

The Solaris Release 8 driver is released in two formats:

1. BRCMbcme.pkg (datastream format)
2. BRCMbcme.tar.Z (compressed and TAR file system format)

Driver Installation

To install the Solaris driver:

1. Change to the directory in which *BRCMbcme.pkg* resides.
2. Perform one of the following two substeps:

   a **`pkgadd -d BRCMbcme.pkg`**
   or

   b Copy *BRCMbcme.tar.Z* to */tmp*
   `cd /tmp`
   uncompress *BRCMbcme.tar*
   `pkgadd -d /tmp`
3. Execute *prtconf* to determine the instance number of the NIC.
4. **`ifconfig bcme[instance_number] plumb`**
5. **`ifconfig bcme[instance_number] ip_address netmask…`**

To make these changes permanent:

1. Using a text editor, create a file named *hostname.bcme[instance_number]* in the */etc* directory.
2. Add the IP address of the interface of this file, then save and exit.
3. Add a proper subnet mask to the file */etc/netmasks*.

Uninstalling the Driver

To uninstall the Solaris driver:

1. **`ifconfig bcme[instance_number] down`**
2. **`ifconfig bcme[instance_number] unplumb`**
3. **`pkgrm BRCMbcme`**

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Customizing the Driver Configuration

To customize the driver, edit */kernel/drv/bcme.conf* and update the respective parameters in this file. These parameters are described below.

ForceSpeedDuplex

ForceSpeedDuplex configures the link (or instance) to a certain speed and duplex mode. By default, all instances are set to AutoNegotiate (0). When set to AutoNegotiate, the instance settings are:

```
ForceSpeedDuplex=0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0;
```

These settings are based on the following values:

Value	Description
0	AutoNegotiate
1	10 Mbps speed and Half Duplex mode
2	10 Mbps speed and Full Duplex mode
3	100 Mbps speed and Half Duplex mode
4	100 Mbps speed and Full Duplex mode

For example, to configure adapters of instance 0 to 100 Mbps Full Duplex and instance 3 to 10 Mbps Half Duplex, set the ForceSpeed Duplex parameter to:

```
ForceSpeedDuplex=4,0,0,1,0,0,0,0,0,0,0,0,0,0,0,0;
```

FlowControl

FlowControl configures the flow control parameters of a link. By default, all instances are set to disable both Tx and Rx flow control (0). As a result, the default instance settings are:

```
FlowControl=0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0;
```

These settings are based on the following values:

Value	Description
0	Both Tx and Rx flow control are disabled.
1	Tx flow control is enabled. Pause frames will be sent if resource is low, but device will not process Rx Pause Frame.
2	Rx flow control is enabled. If the device receives a Pause Frame, it will stop sending. However, the device will not send a Pause Frame if resource is low.
3	Both Rx and TX flow control are enabled. Pause frames will be sent if resource is low. If the device receives a Pause Frame, it will stop sending.
4	Advertise both Rx and TX Flow Control being enabled and negotiate with the link partner. If link AutoNegotiate is not enabled, then both Tx and Rx Flow Control are disabled.

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MaxJumboFrameSize

MaxJumboFrameSize configures the Jumbo Frame feature of a link. The valid range of values for this parameter is 0 to 9000. If the value configured is less than 1500, the Jumbo Frame feature is disabled. Once this is configured, the *ifconfig* command is used to configure the desired MTU size. The default instant setting is 0:

```
MaxJumboFrameSize=0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0;
```

For example, to configure instance 2 to support a Jumbo Frame of up to 9000 bytes, set the MaxJumboFrameSize parameter to:

```
MaxJumboFrameSize=0,0,9000,0,0,0,0,0,0,0,0,0,0,0,0,0;
ifconfig bcme2 mtu 9000
```

TxPacketDescCnt

TxPacketDescCnt configures the number of Tx packet descriptors. The valid range of values for this parameter is 32 to 512. More system memory resources will be used for a larger number of Tx Packet Descriptors. The default value is 100:

```
TxPacketDescCnt=100;
```

RxStdDescCnt

RxStdDescCnt configures the number of Rx packet descriptors. The valid range of values for this parameter is 32 to 512. More system memory resources will be used for a larger number of Rx Packet descriptors. The default value is 500:

```
RxStdDescCnt=500;
```

RxJumboDescCnt

RxJumboDescCnt configures the number of Rx Jumbo packet descriptors. The valid range of values is 32 to 256. More system memory resources will be used for a larger number of Rx Jumbo packet descriptors. This parameter is only used if the Jumbo Frame feature is enabled. The default value is 50:

```
RxJumboDescCnt=50;
```

RxCoalescingTicks

RxCoalescingTicks configures the number of Rx Host Coalescing Ticks in microseconds. This determines the upper boundary of the time interval in which the device will generate an interrupt if one or more frames are received. The default value is 150:

```
RxCoalescingTicks=150;
```

RxMaxCoalescedFrames

RxMaxCoalescedFrames configures the number of Rx Maximum Coalesced Frames parameters. This determines the maximum number of Rx buffer descriptors that the device processes before it will generate an interrupt. The default value is 10:

```
RxMaxCoalescedFrames=10;
```

TxCoalescingTicks

TxCoalescingTicks configures the number of Tx Host Coalescing Ticks in microseconds. This determines maximum time interval before the device generates an interrupt if one or more frames are sent. The default value is 150:

```
TxCoalescingTicks=150;
```


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TxMaxCoalescedFrames

TxMaxCoalescedFrames configures the number of Tx Maximum Coalesced Frames parameters. This determines upper boundary of the maximum number of Tx buffer descriptors that the device processes before it will generate an interrupt. The default value is 10:

```
TxMaxCoalescedFrames=10;
```

RxCoalescingTicksDuringInt

RxCoalescingTicksDuringInt configures the number of Rx Host Coalescing Ticks in microseconds during an interrupt. This determines the maximum time interval before the device generates an interrupt if one or more frames are received during interrupt handling. The default value is 50:

```
RxCoalescingTicksDuringInt=50;
```

TxCoalescingTicksDuringInt

TxCoalescingTicksDuringInt configures the number of Tx Host Coalescing Ticks in microseconds during interrupt. This determines the upper boundary of the time interval that the device generates and interrupt if one or more frames are received during interrupt handling. The default value is 50:

```
TxCoalescingTicksDuringInt=50;
```

RxMaxCoalescedFramesDuringInt

RxMaxCoalescedFramesDuringInt configures the number of Rx Maximum Coalesced Frames parameters during interrupt handling. This determines the upper boundary of the maximum number of Rx buffer descriptors that the device processes before it will generate an interrupt during interrupt handling. The default value is 4:

```
RxMaxCoalescedFramesDuringInt=4;
```

TxMaxCoalescedFramesDuringInt

TxMaxCoalescedFramesDuringInt configures the number of Tx Maximum Coalesced Frames parameters during interrupt handling. This determines the upper boundary of the maximum number of Tx buffer descriptors that the device processes before it will generate an interrupt during interrupt handling. The default value is 4:

```
TxMaxCoalescedFramesDuringInt=4;
```

StatsCoalescingTicks

StatsCoalescingTicks configures how often adapter statistics are DMAed to the host memory in microseconds. The default value is 1000000:

```
StatsCoalescingTicks=1000000;
```

DoubleCopyTxBufferSize

DoubleCopyTxBufferSize configures a double copy Tx buffer size. If the packet to be transmitted is less than this parameter and spans more than one fragment, the fragments of this packet will be combined into one fragment. The default value is 64:

```
DoubleCopyTxBufferSize=64;
```


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ndd Command

Driver configurations can also be temporarily changed with the ndd command. Any changes made with this command are temporary and will be lost when you reboot the system. To make permanent configuration changes, modify *bcme.conf* instead.

NOTE: Refer to the parameter descriptions as required in "Customizing the Driver Configuration" on page 80.

To display parameters that are configurable using ndd:

```
ndd /dev/bcme '?'
```

The system should return the following:

```
? (read only)
Instance (read and write)
ForceSpeedDuplex (read and write)
FlowControl (read and write)
TxPacketDescCnt (read and write)
RxStdDescCnt (read and write)
RxCoalescingTicks (read and write)
RxMaxCoalescedFrames (read and write)
TxCoalescingTicks (read and write)
TxMaxCoalescedFrames (read and write)
RxCoalescingTicksDuringInt (read and write)
RxMaxCoalescedFramesDuringInt (read and write)
TxCoalescingTicksDuringInt (read and write)
TxMaxCoalescedFramesDuringInt (read and write)
StatsCoalescingTicks (read and write)
DoubleCopyTxBufferSize (read and write)
```

Configuring a NIC

To configure a particular NIC, the parameter instance must be properly set. For example, to force a NIC of instance 1 to 100Mbps Full Duplex:

```
ndd -set /dev/bcme Instance 1
ndd -set /dev/bcme ForceSpeedDuplex 4
```

To query the current configuration of Flow Control of instance 3:

```
ndd -set /dev/bcme Instance 3
ndd -get /dev/bcme FlowControl
```


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10 3Com Management Programs

Overview

The 3Com Management Programs are an integrated graphical user interface application that provides status reports for all LAN NICs/controllers in your system ("Vital Sign"); a comprehensive diagnostics tool for Gigabit Ethernet controllers ("Diagnostics"); an in-depth analysis of physical cable transceiver conditions ("Cable Analysis"); an easy way to configure the load balance and failover by grouping multiple NICs/controllers ("Load Balance/Virtual LAN"); and detailed performance statistics for each selected NIC/controller ("Statistics").

3Com Management Programs suite is designed to run in one of the following 32-bit Windows operating systems:

- Microsoft Windows NT 4.0 Server and Enterprise Server
- Microsoft Windows 2000 Server, Advanced Server, and Datacenter Server

To configure the load balance, failover, and VLAN configuration, use 3Com Management Programs or the Advanced Server Features. Using Advanced Server Features is the preferred method during installation; using the 3Com Management Programs is more suitable for use after installation.

Installing the Management Programs

To install the 3Com Management Programs software, do the following:

1. Insert the *3Com Installation CD* into your CD-ROM drive.
2. From the Main menu, click *NIC Software*.
3. Click *Install 3Com Management Programs*.
4. Click *Install 3Com Management Programs*.
5. 3Com Management Programs Setup screen appears. Click *Next*.
6. Click *Yes* to agree to the License Agreement.
7. Select the components you want to install and clear the ones you do not want to install. Click *Next*. The files are installed.
8. Click *OK* and reboot the computer to complete installation. 3Com Management Programs are now available under Control Panels.

NOTE: If you select to install the SNMP or DMI service and they are not installed on your system, you will get an error message during installation. In Windows 2000, however, no DMI will be installed or selected.

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Removing the Management Programs

To remove the 3Com Management Programs software, do the following:

1. Select *Start/Control Panel*, then double-click *Add/Remove Programs*.
2. Select *Management Programs* and click *Change/Remove*.
3. Select *Remove* from the Modify, Repair, Remove menu and follow the prompts.

Initializing the Management Programs

To initialize the 3Com Management Programs software, do the following:

1. Click *Start*, *Settings*, and then click *Control Panel*.
2. Double-click the Gigabit Ethernet icon.

Vital Sign

The Vital Sign screen allows you to view vital NIC information, network status, and network connectivity. Active NICs are listed. Select one of the listed NICs to view its vital sign information.

NOTE: Information for some NICs is less comprehensive than for others.

Interface components of the Vital Sign window are described below:

- **IP Address:** Network address that is associated with the selected NIC. An all-zero value (000.00.000.00) of this parameter indicates the associated driver has not been bound with Internet Protocol (IP).
- **Physical Address:** Physical MAC (Media Access Control) address that is assigned to the selected NIC by the NIC's vendor. This parameter will never be all zeros.
- **Driver Status:** Indicates the status of the driver that is associated with the selected NIC. The possible values for this parameter are:
  - Driver Loaded (normal operating mode)—The driver associated with the selected NIC was loaded by the Windows operating system and is functioning.
  - Driver Not Loaded—The driver associated with the selected NIC has not been loaded by the Windows operating system.
  - Information Not Available—The value is not obtainable from the driver that is associated with the selected NIC.
- **Driver Version:** Indicates the current version of the software driver that is associated with the selected NIC.
- **Device Number:** Indicates the PCI bus number and the device number for the selected NIC.

  Example: [0] 14 indicates the NIC resides in PCI bus 0, device 14.
- **Operating Mode:** Indicates the current operating mode of the NIC. The possible values are:

  10 Mbps Half Duplex
  10 Mbps Full Duplex
  100 Mbps Half Duplex
  100 Mbps Full Duplex
  1000 Mbps Full Duplex
- **Interrupt:** Indicates the interrupt line number that is associated with the selected NIC. Valid numbers range from 2 to 25.

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- **Memory Address:** Indicates the memory mapped address that is assigned to the selected NIC. This value can never be zero.
- **PCI Bus Mode:** Indicates the type and mode of PCI bus slot that is occupied by the selected NIC. The possible values of this parameter are:

  PCI 33MHz 32-bit bus
  PCI 33MHz 64-bit bus
  PCI 66MHz 64-bit bus
  PCI-X 100 MHz 64-bit bus
- **Network Status:** Provides overall status of the following:
  - Link Status OK—When GREEN, it indicates there is a link established at 10, 100, or 1000 Mbps. When RED, it indicates that a link is not established.
  - Receive OK—Indicates the selected NIC is able to receive data (gigabit only).
  - Transmit OK—Indicates the selected NIC is able to transmit data (gigabit only).

NOTE: Only NICs with a 1000 Mbps link will light the Local Receiver/Remote receiver LEDs.

NOTE: Parameters (3 thru 10) are not applicable on other vendors' NICs and these values are displayed as: Information Not Available.

Diagnostics

The Diagnostics screen allows you to view information for 3Com NICs.
This function is used to test the physical NIC components.

NOTE: Network connection will be lost when running these tests.

Interface components of the Diagnostics window are described below:

- **Control Register Test:** Verifies the read and write capabilities of the network controller registers by writing various values to the registers and verifying the result. The device driver uses these registers to perform network functions such as sending and receiving information. If the test fails, the network NIC may not work properly.
- **MII Register Test:** Verifies the read and write capabilities of the physical layer chip registers. The physical layer chip is used to control the electrical signals on the wire and for configuring network speed, such as 1000 Mbps.
- **EEPROM Test:** Verifies the content of the EEPROM by reading a portion of the EEPROM and computing the checksum. The test fails if the computed checksum differs from the checksum stored in the EEPROM. An EEPROM image upgrade will not require a code change for this test.
- **Internal Memory Test:** Verifies that the network controller internal memory is functioning properly. The test writes patterned values to the memory and reads back the results. The test fails if an erroneous value is read back. The network controller will not function without its internal memory.
- **On Chip CPU Test:** Verifies the operation of the two internal CPUs in the network controller.
- **Interrupt Test:** Verifies that the NDIS driver is able to receive interrupts from the network controller.
- **MAC and PHY Loopback Test:** Verifies that the NDIS driver is able to send packets and receive packets from the network controller. (See "DOS Diagnostic Failures" on

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page 97 for information about using the DOS Diagnostic program B57DIAG.exe to run the PHY Loopback Test.)

- **Test LED:** Verifies that the NIC LED is working properly.

Cable Analysis

From the Cable Analysis screen, the user can monitor conditions of an Ethernet CAT5 cable connection within a cable plant in an Ethernet network. The software detects various cable conditions such as the cable length between two given nodes, cable pair breakage, cable pair polarity, and data skew between cable pairs. Given a graphical environment, it can also display the frequency response characteristics in each cable pair. The Cable Analysis screen allows you to display the following features:

- Status
- Length
- Margin
- Frequency

NOTE: Network connection will be lost when running these tests.

- **Status:** This field displays the cable condition status based on the cable computation algorithms. Any detected cable breakage will be displayed by messages in this status field as well as the inability to detect cable condition message resulted from the algorithms.

NOTE: User should pay attention to the status message as other field values in the Cable Analysis screen are invalid if a cable breakage or unknown cable condition has been detected by the algorithms.

- **Length:** Allows you to verify cable length and determine whether your configuration has the appropriate cable (calculated by cable loss and return loss algorithms). This utility allows you to determine whether the problem is with the NIC or in the cable plant.

  Interface components of the Cable Analysis/Channel Pairs window are described below:

- **Cable Length Field:** Presents the estimated cable length (in meters) for each individual channel, using two different algorithms.
- **Margin:** Minimum distance between the measured cable pair and the maximum IEEE 802.3ab limits (in dB).
- **Frequency Margin:** Measures the minimum distance between the measured cable pair and the maximum IEEE 802.3ab limits (in MHz) in the frequency domain.

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Load Balance/Virtual LANs

The Load Balance/Virtual LANs screen allows you to configure advanced features. Any available NIC can be configured as part of a team. Teaming is a method of grouping multiple NICs to a virtual NIC (bundling multiple NICs to appear as a single NIC). The benefit of this approach is load balancing.

By selecting each of the available NICs, and moving it to the Load Balance Members column, this appears as one NIC. Each member in the Load Balance Member list shares the traffic burden of all three members.

The Standby Member field is used to permit the selection of one of the team members to handle traffic, should all other members in the Load Balance Member list fail (failover). The selected Standby Member will not handle any traffic unless all Load Balance Members fail. When one Load Balance Member (or more) is restored (fail-back), traffic will then be handled by the restored team member(s).

1. Right-click the node of Load Balance tree to display a drop-down menu that is associated with the selected node type.
2. For the team node, the menu items are *Delete* and *Properties*. You can either select *Delete* to remove the highlighted team or select Properties to display the Team Properties dialog box.
3. From the Team Properties dialog box, you can change the team name and/or change the team type.
4. For the adapter node, the menu items are *Unassign* and *Properties*. You can select *Unassign* to remove the selected adapter from the team or select Properties to display the adapter Properties. All display in adapter Properties are read-only.
5. For the VLAN node, the menu items are *Delete* and *Properties*. You can either select Delete to remove the highlighted VLAN or select Properties to display the VLAN Properties. The only writable item on this dialog box is the VLAN name.

Creating a New Team

1. From the Load Balance/Virtual LAN window, click *Create Team*.

   This displays the Add New Team window.
2. Enter a team name in the Name field, then select the Team Type and click *OK*.
3. Add an available NIC to the team:
   - In the Available Adapters list, select the NIC(s) that you want to add to the team you created in the previous step. Move the selected NIC(s) to the Team Members list box using the double arrows.
   - When you have finished configuring failover teams, click *OK* or *Apply* to accept the changes.

NOTE: At least one NIC must be displayed in the Team Members list box.

The minimum number of characters that can be used in a team name is one. The maximum number of characters that can be used in a team name is 39. A team name cannot begin with spaces. If you attempt to use an identical team name, an error message displays indicating that the entered name already exists. The maximum number of members in a team is eight.

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4 Click *OK*. When a team has been correctly configured, one Virtual Team NIC driver will be created for each configured team.

   When you create a generic trunking team, you cannot select a Standby Member. Standby Members work only with Load Balance and Failover Teams.

5 Configure the Team IP address if necessary. If other NICs in your system use TCP/IP bindings, the TCP/IP Properties window will open.

6 To access the Internet Protocol Properties window, right-click the *My Network Places* icon and select *Properties*.

7 When the Network and Dial-up Connections window opens, right-click any network NIC. This displays the Internet Protocol (TCP/IP) Properties window.

8 Configure the IP address and any other necessary TCP/IP configuration for the team and click *OK* when finished.

Adding a VLAN

You can add VLANs to a team. The concept behind this is that you are adding multiple virtual NICs that are on different subnets. The benefit of this is that your server can have one NIC that can belong to multiple subnets. With a VLAN you can couple the functionality of load balancing for the Load Balance Members and you can employ a failover NIC.

You can define as many as 64 VLANs per team. VLANs can be created only when all members are 3Com NICs. If you try to create a VLAN with a non-3Com NIC, an error message displays.

To configure a new VLAN, follow these steps:

1 From the Load Balance/Virtual LAN window, select the team to which you want to add a VLAN.

2 Enter a VLAN ID and VLAN Name, then click *Add VLAN*.

   If you enter a VLAN name or ID and the name already exists, an Input Error message is displayed.

   The Untagged VLAN checkbox is exclusively used by the VLAN ID field. To use VLAN ID zero, simply check this box.

3 When you have finished adding VLANs to this team, click *OK*. A new virtual NIC is created for each VLAN.

NOTE: To maintain optimal NIC performance, your system should have 64 MB of system memory for each eight VLANs created.

Deleting a VLAN

To delete a configured VLAN, follow these steps. If you delete a Team, any VLANs configured for that team will also be deleted.

1 From the Load Balance/Virtual LAN window, select the VLAN you want to delete, and click *Remove VLAN*. The selected VLAN will be deleted from the Load Balance/Virtual Lan Configuration window.

2 When you have finished deleting VLANs, click *OK* to accept the changes.

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Saving the Configuration

1. With the Team and VLAN configuration loaded, click *Save As* at the Load Balance/ Virtual Lan tab.
2. At the Save As screen, enter the path and filename of the new configuration file. A "bcg" extension will be placed on the filename. Click *Save*.
3. A configuration file will be placed in the directory.

   This new configuration file is a text file and can be viewed by any text editor. The file contains both adapter and team configuration information.

Restoring the Configuration

1. Click *Restore* at the Load Balance/Virtual Lan tab.
2. If a configuration is already loaded, the Restore Configuration screen will appear. Click *Yes* to continue.

   Note that all current configuration data currently loaded will be lost. To save the current configuration, do the Save Configuration procedure above.
3. At the Open screen, select the configuration file to be restored and click *Open*.
4. If the configuration file to be restored is elsewhere, navigate to that location to select the file.
5. The new configuration will be loaded. Click *Apply* to complete the restoration. Until *Apply* is clicked, the configuration has not been restored.

Load Balance/Virtual LAN Statistics

The Statistics screen allows you view traffic statistics. Statistical values and coverage is more comprehensive for some NICs than for others.

General

Interface components of the Statistics/General window are described below:

- Frames Tx OK—Count of frames that are successfully transmitted. This counter is incremented when the TransmitStatus is reported as transmitOK.
- Frame Rx OK—Count of frames that are successfully received (receiveOK). This does not include frames received with frame-too-long, FCS, length or alignment errors, or frames lost due to internal MAC sublayer error. This counter is incremented when the ReceiveStatus is reported as receiveOK.
- Directed Frames Tx—Count of directed data frames that are successfully transmitted.
- Multicast Frames Tx—Count of frames that are successfully transmitted, as indicated by the status value transmitOK, to a group destination address other than broadcast.
- Broadcast Frames Tx—Count of the frames that were successfully transmitted as indicated by the TransmitStatus transmitOK, to the broadcast address. Frames transmitted to multicast addresses are not broadcast frames and are excluded.
- Directed Frames Rx—Count of directed data frames that are successfully received.
- Multicast Frames Rx—Count of frames that are successfully received and are directed to an active nonbroadcast group address. This does not include frames received with frame-too-long, FCS, length or alignment errors, or frames lost due to internal MAC sublayer error. This counter is incremented as indicated by the receiveOK status, and the value in the Destination field.

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- Broadcast Frames Rx—Count of frames that are successfully received and are directed to the broadcast group address. This does not include frames received with frame-too-long, FCS, length or alignment errors, or frames lost due to internal MAC sublayer error. This counter is incremented as indicated by the receiveOK status, and the value in the Destination field.

IEEE 802.3

Interface components of the Statistics/IEEE 802.3 window are described below:

- Frames Rx with Alignment Error—Count of frames that are not an integral number of octets in length and do not pass the FCS check. This counter is incremented when the ReceiveStatus is reported as alignmentError.
- Frames Tx with one Collision—Count of frames that are involved in a single collision, and are subsequently transmitted successfully. This counter is incremented when the result of a transmission is reported as transmitOK and the attempt value is 2.
- Frames Tx with more than one Collision—Count of frames that are involved in more than one collision, and are subsequently transmitted successfully. This counter is incremented when the TransmitStatus is reported as transmitOK and the value of the attempts variable is greater than 2 and less than (or equal to) attemptLimit.
- Frames Tx after Deferral—Count of frames whose transmission was delayed on its first attempt because the medium was busy. Frames involved in any collision are not counted.

Custom Tab

Descriptions of interface components of 3Com's Management Programs/Custom tab window are described below.

- Number of Interrupts generated by this adapter—Number of interrupts generated by NIC.
- Number of Interrupts avoided by this adapter—Number of interrupts avoided by NIC.
- Tx. Max Coalesce Frames Threshold hit—Number of times Send Max Coalesce Frames Threshold hit.
- Rx. Max Coalesce Frames Threshold hit—Number of times Recv Max Coalesce Frames Threshold hit.
- DMA write Queue was full—Number of times DMA write queue was full.
- DMA write High Priority Queue was full—Number of times DMA write high priority queue was full.
- DMA Read Queue was full—Number of times DMA read queue was full.
- DMA Read High Priority Queue was full—Number of times DMA read high priority queue was full.
- Send Data Completion FTQ was full—Number of times send data completion FTQ(Flow Through Queue) was full.
- NIC ran out of the Recv. Buffer—Number of times NIC ran out of the Recv Buffer Descriptors.
- Frames size less than 64-byte with bad FCS—Frames size less than 64-byte with bad FCS(Frame Checksum).
- MAC Rx. w/ Pause Command and Length = 0—MAC control frames with pause command and length equal to zero.
- MAC Rx. w/ Pause Command and Length greater than 0—MAC control frames with pause command and length greater than zero.
- MAC Rx. w/ no Pause Command—MAC control frames with no pause command.
- MAC Sent Xon—MAC Transmit with Xon was on.
- MAC Sent Xoff—MAC Transmit with Xon was off.

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11 Troubleshooting

Hardware Diagnostics

Loopback diagnostic tests are available for testing the NIC hardware under Windows. These tests provide access to NIC internal/external diagnostics, where packet information is transmitted across the physical link. See "Diagnostics" on page 87.

Checking Port LEDs

The NIC has four LEDs, one for each port speed option (10 Mbps, 100 Mbps, and 1 Gbps), and one for Data Transfer. The three port speed LEDs indicate active links, and the data LED indicates data transfer status. When the driver has been loaded and the cables are connected properly, the appropriate speed LED is lit and the data LED is on if data traffic is present.

Before the port LEDs can provide troubleshooting information, the NIC must be connected to the network (see "Installing and Connecting the NIC" on page 7) and the network drivers for your particular operating system must be installed.

1. Verify that the NIC driver software has been installed and that the NIC is connected to a network.
2. Check to see that the NIC status LEDs operate as described in the following table:

LED	State	Description
1000	On	Good Gigabit Ethernet link.
	Off	No 1000 Mbps link; possible link at different speed, possible bad cable, bad connector, or configuration mismatch.
100	On	Good 100 Mbps Fast Ethernet link.
	Off	No 100 Mbps link; possible link at different speed, possible bad cable, bad connector, or configuration mismatch.
10	On	Good 10 Mbps Ethernet link.
	Off	No 10 Mbps link; possible link at different speed, possible bad cable, bad connector, or configuration mismatch.
ACT	Blinking	Brief bursts of data detected on the port.
	On	Streams of data detected on the port.
	Off	No data detected on the port.

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Troubleshooting Checklist

WARNING: Before removing or inserting the NIC, please review all precautions outlined under "Safety Precautions" on page 9.

The following checklist provides recommended actions to take to resolve problems installing the Gigabit Ethernet NIC or running it in your system.

- Inspect all cables and connections. Verify that the cable connections at the Gigabit Ethernet NIC and the switch are attached properly. Make sure that the cable length and rating are compliant with the requirements listed in "Connecting the Network Cables."
- Check the NIC installation by reviewing "Installing the Hardware." Make sure that the NIC board is properly seated in a PCI slot. Check for specific hardware problems, such as obvious damage to board components or the PCI edge connector.
- Check the configuration settings and change them if they are in conflict with another device.
- Make sure that your system is using the latest BIOS.
- Try inserting the NIC in another slot. If the new position works, the original slot in your system may be defective.
- Replace the failed NIC with one that is known to work properly. If the second NIC works in the slot where the first one failed, the failed NIC is probably defective.
- Install the NIC in another functioning system and run the tests again. If the NIC passed the tests in the new system, the system may be defective.
- Remove all other NICs from the system and run the tests again. If the NIC passes the tests, other NICs may be causing contention.

Checking if Proper Drivers are Loaded

The following section describes how to check if the proper drivers are loaded for Windows, NetWare, and Linux.

Windows

The Vital Sign screen of the 3Com Management Programs allows you to view vital NIC information, network status, and network connectivity. Active NICs are listed.

1. From the Vital Sign screen, select the NIC to be tested.
2. Click *Refresh* to display the driver status of the selected adapter.

NOTE: Information for non-3Com adapters is less comprehensive than information listed for 3Com adapters.

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NetWare

From the command line, type **`config`** then press *Enter*. The following status information is displayed:

```
3Com Gigabit Ethernet NIC
Version:
Hardware Setting:
Mode Address:
Frame Type:
Board Name:
Lan Protocol: ARP (see note)
Lan Protocol: IP Addr: (see note)
```

NOTE: The LAN protocol status appears after assigning an IP address to the adapter (that is, bind).

Linux

To verify that the bcm5700.o driver is loaded properly, run "lsmod" and a line similar to the following will appear if the driver is loaded:

Module	Size	Used by
BCM5700	<size>	<n>

where <size> is the size of the driver in bytes and <n> is the number of adapters configured using 'ifconfig'.

Running Cable Analysis

The following section describes how to run the cable diagnostics from the 3Com Management Programs. See "3Com Management Programs" on page 85 for setups and initialization.

NOTE: This test is designed to work for a 1 gigabit copper link (1000BASE-T) only.

From the Cable Analysis screen the user can monitor conditions of an Ethernet CAT5 cable connection within a cable plant in an Ethernet network.

NOTE: Network connection will be lost when running these tests.

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Length

The Length sub tab allows you to verify cable length and determine whether your configuration has the appropriate cable, which are calculated by cable loss and return loss algorithms. This utility allows you to determine whether the problem is with the adapter or in the cable plant.

1. From the Cable Analysis/Length screen, select the NIC to be tested.
2. Click *Initialize*, and then click *Test* to display the status of the selected adapter.

Interface components of the BASCS Cable Analysis window are described below:

- **Cable Length Field**
  This field presents the estimated cable length in meter on each individual channel using two different algorithms.
- **Margin**
  Margin yields the minimum distance between the measured cable pair and the maximum IEEE 802.3ab limits. The unit is in dB.
- **Frequency Margin**
  This measures the minimum distance between the measured cable pair and the maximum IEEE 802.3ab limits in the frequency domain. The unit is in MHz.

Cable Diagnostics Display

The combination of the cable length and the cable status reveal the state of the cable connection between the local adapter and the far end node (hub/switch/routers). The cable status will display possible problems associated with the cable if the cable is not in working order. If the cable is not in working order, displayed cable length is meaningless, since the correct cable length cannot be calculated properly with a broken cable. The status window displays various error messages that diagnose possible problems associated with the cable.

Testing Network Connectivity

The following section describes how to test network connectivity for Windows, NetWare, and Linux.

Windows

Use the ping command to determine if network connectivity is working.

1. Select *Start/Run*.
2. Type **`cmd`** and click *OK*.
3. Type **`ipconfig/all`** to display the command window.
4. Enter **`ping <IP address>`** from the command line.
   This displays the network connectivity information.

NetWare

Use Ping and IP host on the network to verify connection has been established.

1. From the command line, type **`load ping <IP address>`** then press Enter.
2. This will display the packet send/receive status.

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Linux

To verify that the Ethernet interface is up and running, run *ifconfig* to check the status of the Ethernet interface. To check the statistics on the Ethernet interface, you can also use *netstat -i*. Consult manual pages for more information on *ifconfig* and *netstat*.

DOS Diagnostic Failures

Running the DOS diagnostic B57DIAG.exe can result in false failures under the following circumstances:

- The DOS diagnostic B57DIAG.exe will fail if EMM386.exe is loaded in low memory. Do not use EMM386.exe when running the DOS diagnostic program.
- When using the DOS diagnostic B57DIAG.exe for the fiber NIC (3C996-SX), you must use the *-npol* option to pass all diagnostic tests. For example:

  ```
  b57diag -npol
  ```

  Omiting the *-npol* option causes the fiber NIC to fail each diagnostic test.

Wake-on-Lan

The fiber version of the Gigabit Server NIC will not operate with Wake-on-LAN (WOL). You must disable WOL when using this version of the Gigabit Server NIC.

Known Problems

This section provides a list of known software problems and solutions for Windows 2000 and Linux.

Windows 2000

Problem	Solution
Able to create LAC connections icons having same name under network properties menu.	Each network adapter installed properly will have an icon in Network Properties window. The name of the icon is usually in the form of "Local Area Connection ##" and where ## is a number starting from 1. The names of icon can be changed by right clicking the icon and selecting rename. The name of the icon is only meaningful to the Network Properties window. Sometimes the system administrators will rename these icons to easily differentiate the network connections. When Advanced Server Features is configured, Advanced Server Features will create additional adapter icons and rename the icons. The naming convention is to allow end users to quickly identify the adapter with corresponding team and VLAN. The names of the icons created by Advanced Server Features therefore are not recommended to be changed.
Uninstalling the Advanced Server Features software and user is prompted to reboot early.	After configuring Advanced Server Features team, the system may sometimes prompt user to reboot. This is because Plug and Play may fail to commit any change in the network protocol binding. Users can choose not to reboot and continue configuring intermediate driver without having any side effect. When user has finished all the configuration, it is required to reboot.
Cannot enable VLAN after it is disabled.	Advanced Server Features program creates additional network connections in "Network Connection and Dial-up" Window. Similar to physical network connections, these virtual connections can be disabled via the context menu. However, if these virtual connections are re-enabled, the system will report error as "connection failed!". This is known problem with Windows 2000. When this happens, rebooting the system enables the virtual connection again.
Able to configure Internet Connection Sharing (ICS) when there aren't any unassigned adapters.	Windows 2000 networking is shipped with the Internet Connection Sharing (ICS), which is designed to allow multiple computers to access the Internet through a Windows 2000 system. To configure ICS, a user would need to select a network connection as "outside" connection, and another network connection as "inside" connection. 3Com has observed that ICS allows any available network connection to be "outside" and "inside," regardless of the Advanced Server Features team configuration. 3Com recommends that the user not select any network connection that is part of the Advanced Server Features team to be "outside" and "inside."

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Problem	Solution
Team configuration is not retained when user goes back to edit.	In configuring Advanced Server Features teams, the actual changes of the configuration is not committed until the user click "OK" in "Network Properties" window. If a user chooses not click OK and instead goes back to the Advanced Server Features team configuration window, all the previous uncommitted changes will be lost and the user will need to re-enter the configurations. As a workaround, the user should always click *OK* in the Network Properties window after making changes.
IP address is configurable on a member of the team.	When a team is created, the TCP/IP properties for the adapters are unselected. The user can manually select and configure TCP/IP properties of the adapters and configure an IP address. This is a limitation of the Windows 2000 network installation paradigm, where this invalid configuration is still allowed.
When creating 64 VLANs, all virtual adapters show disconnected or one of the 64 VLANs show disabled.	The maximum VLAN configurations are 63 tagged and one untagged VLAN ID 0. If 64 tagged VLANs are created, they are disconnected. A reboot is required and only 63 tagged VLANs show links, while a 64th is disabled.

Linux

Problem	Solution
Enabling the Flow-Control on the network adapter does not function.	The enabling Flow-Control feature does not work as expected. When the flow control is enabled on the switch and enabled on the network adapter, it seems to function correctly. But when the Flow-control is enabled on the network adapter and disabled on the switch, it does not function correctly.
The Linux driver can not be installed on Red Hat version 7.0.	This problem happens in Red Hat 7, where the kernel symbols driver code does not match the one in the source. Rebuilding the kernel will resolve this problem.
Compiling the driver fails under SuSE's 7.1.	Ensure the full 2.2.18 source tree is installed. The source for 2.2.18 may be installed by installing the lx_sus22.rpm package (provided on CD or from SuSE's FTP site). The 2.4.0 source may be installed by installing the lx_sus24.rpm package in situations where the installation process did not automatically provide the source. Note that the user may need to resolve dependency and package conflict issues in the process of installing these packages. Also note, that the user will need to have the appropriate C compilers and binaries installed as usual. Once the source is installed, the user will need to copy over the following configuration files to the appropriate locations in the source tree: /boot/vmlinuz.config, /boot/vmlinuz.version.h /boot/vmlinuz.autoconf.h cp /boot/vmlinuz.config /usr/src/linux-2.2.18.SuSE/.config cp /boot/vmlinuz.version.h /usr/src/linux-2.2.18.SuSE/include/linux/version.h cp /boot/vmlinuz.autoconf.h /usr/src/linux-2.2.18.SuSE/include/linux/autoconf.h A rebuild of the source tree is recommended. **`make oldconfig`** **`make dep`** Rebuild BCM5700 driver module.

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A Key Protocols and Interfaces

CIM

The Common Information Model (CIM) is an industry standard defined by the Distributed Management Task Force (DMTF). Microsoft implements CIM on Windows platforms such as Windows 2000. 3Com will support CIM on the Windows 2000 platform.

The 3Com implementation of CIM will provide various classes to provide information to users through CIM client applications. Please note that CIM data provider will provide data only, and users can choose their preferred CIM client software to browse the information exposed by CIM provider. The current implementation of CIM is based on IBM FTMI beta SDK, and is subject to change in the future.

3Com CIM provider provides information through BRCM_NetworkAdapter and BRCM_ExtraCapacityGroup classes. BRCM_NetworkAdapter class provides NICs including 3Com and other vendors' controllers. BRCM_ExtraCapacityGroup class provides team configuration for the Advanced Server Features. Current implementation will provide team information and information of physical network adapters in the team.

Advanced Server Features provides events through event logs. Users can use the "Event Viewer" provided by Windows 2000, or use CIM to inspect or monitor these events. 3Com CIM provider will also provide event information through CIM's generic event model. These events are __InstanceCreationEvent, __InstanceDeletionEvent and __InstanceModificationEvent, and are defined by CIM. CIM requires the client application to register the events from the client application, using queries as examples shown below in order to receive events properly.

SELECT * FROM __InstanceModificationEvent where TargetInstance ISA "BRCM_NetworkAdapter"
SELECT * FROM __InstanceModificationEvent where TargetInstance ISA "BRCM_ExtraCapacityGroup"
SELECT * FROM __InstanceCreationEvent where TargetInstance ISA "BRCM_NetworkAdapter"
SELECT * FROM __InstanceDeletionEvent where TargetInstance ISA "BRCM_NetworkAdapter"
SELECT * FROM __InstanceCreationEvent where TargetInstance ISA "BRCM_ActsAsSpare"
SELECT * FROM __InstanceDeletionEvent where TargetInstance ISA "BRCM_ActsAsSpare"

For detailed information about these events, please refer to CIM documentation.

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DMI

The DMI PCI Hot-Plug service operates in conjunction with the DMI Service Provider software component. It provides hot-swap/ hot-add functionality for the NIC in Windows 2000 and Windows NT 4.0 hot plug systems. You should consult the system documentation to determine the supported Hot-Plug capabilities.

The hot-swap feature allows the user to replace a NIC without bringing down the system. Hot-add functionality allows the user to add a new NIC into the system without bringing down the system. These capabilities reduce down time, which is critical to many servers operating in the Windows 2000 and Windows NT 4.0 environment.

To enable this feature, the PC system hardware has to be hot-plug capable and operate on Windows 2000 and Windows NT 4.0 operating systems. A third party provided DMI 2.0 Service Provider software has to be installed prior to the installation of the 3Com DMI PCI Hot-Plug service software. This Service Provider software is available from either Intel Corporation, or Smart Technology Enabler Corporation. The system also requires the Hot Plug or Hot Swap application software from the system vendor to enable this feature. You should consult the system documentation to determine the recommended installation instructions for the DMI software.

The hot-swap and hot-add features are available to the NIC depending on the system vendor application software. Some vendors may support one or both features depending on their system hardware and software implementation.

You are limited to add or replace a NIC with a 3Com NIC of **identical** hardware configuration.

SNMP

The Advanced Server Features sub-agent, baspmgnt.dll, is designed for the Windows 2000 and Windows NT SNMP Service. It is required to install the SNMP service before installing Advanced Server Features sub-agent.

The Advanced Server Features sub-agent allows an SNMP manager to actively monitor the configurations and performance of the Advanced Server features. The sub-agent also provides an alarm trap to an SNMP manager to inform the manager of any changes to the conditions of the Advanced Server Features component.

The Advanced Server Features sub-agent allows monitoring of the configurations and statistics for the Advanced Server Features teams, the physical NICs participating in a team, and the virtual NIC adapters created as the result of teaming. Non-teamed NIC adapters are not monitored at this time. The Advanced Server Features configuration data includes information such as team IDs, physical/virtual/VLAN/team adapter IDs, physical/ virtual/VLAN/team/ adapter descriptions, and MAC addresses of the adapters.

The statistics include detailed information such as data packets transmitted and received for the physical/virtual/VLAN/team NICs.

The alarm trap forwards information about the changes in configuration of the physical NICs participating in a team, such as physical NIC link up/down, and NIC installed/ removed events.

To monitor this information, an SNMP manager needs to load the BASP MIB database files to allow monitoring of the information described above. These files shown below, are included with the enclosed *3Com Installation CD*:

baspconfig.mib
baspstat.mib
basptrap.mib

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NIC Teaming

Teaming provides traffic load balancing and redundant NIC operation in the event that a network connection fails. When multiple Gigabit Ethernet NICs are installed in the same server, they can be grouped into teams. Each team, with up to 8 ports or 8 NICs, can be configured on the server. If traffic is not identified on any of the NIC team member connections due to failure of the NIC, cable, switch port, or switch (where the teamed NICs are attached to separate switches), the load distribution is re-evaluated and re-assigned among the remaining team members. In the event all the primary NICs are down, the hot stand-by NIC becomes active. Existing sessions are maintained, causing no user impact.

The Advanced Server Features program supports three schemes of load balancing: Load Balancing, Link Aggregation (802.3ad), and Generic Link Aggregation (Trunking).

NOTE: Gigabit Ethernet NICs can be grouped into failover teams with an Intel 82559 LOM.

Load Balancing

Implementation of load balancing is based on IP flow. This feature supports balancing IP traffic across multiple NICs (that is, team members) in a bi-directional mode. Each NIC in the team has a separate MAC address. It provides automatic fault detection and dynamic failover to another team member or to a hot stand-by member; this is done independently of layer 3 protocol (IP, IPX, NetBEUI). It works with existing layer 2 and 3 switches.

Link Aggregation (802.3ad)

This mode supports Link Aggregation Control Protocol (LACP) and conforms to the IEEE 802.3ad specification. Configuration software allows you to statically configure which NICs are to participate in a given team. Because this mode supports LACP, a valid link aggregation group should be negotiated with the link partner. The negotiated group must satisfy the terms established by the configuration SW (physical NICs are not able to move dynamically from one team to another team). If the link partner is not correctly configured for 802.3ad link configuration, errors are detected and noted. With this mode, all NICs in the team are configured to receive packets for the same MAC address. The outbound load-balancing scheme is determined by the Advanced Server Features driver. The team's link partner determines the load-balancing scheme for inbound packets.

Generic Link Aggregation (Trunking)

This mode is very similar to 802.3ad in that all NICs in the team must be configured to receive packets for the same MAC address. However, this mode does not provide LACP or marker protocol support. This mode supports a variety of environments where a NIC's link partners are statically configured to support a proprietary trunking mechanism. For instance, this mode could be used to support the (Lucent) "OpenTrunk" or the (Cisco Systems) Fast EtherChannel (FEC). This mode is a "light" version of the 802.3ad link aggregation. This approach is much simpler, in that there is not a formal link aggregation control protocol. As with the other modes, the creation of teams, and the allocation of physical NICs to various teams, is done statically via user configuration software.

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Failover Teaming

Failover Teaming provides redundant NIC operation in the event that a network connection fails. When multiple Gigabit Ethernet NICs are installed in the same server, they can be grouped into teams. Each team must have at least one NIC, but can support up to eight NICs. The number of teams is limited by the number of NICs that are installed.

If the primary NIC in a team is disconnected because of failure of the NIC, cable, or switch port, the secondary team member becomes active, redirecting both inbound and outbound traffic originally assigned to the primary NIC. Sessions will be maintained, causing no impact to the user.

VLANs Overview

Virtual Local Area Networks (VLANs) allow you to split your physical LAN into logical subparts, to create logical segmentation of workgroups and to enforce security policies among each logical segment. Each defined VLAN behaves as its own separate network, with its traffic and broadcasts isolated from the others, increasing bandwidth efficiency within each logical group. As many as 64 VLANs can be defined for each NIC on your server, depending on the amount of memory available in your system.

Although VLANs are commonly used to create individual broadcast domains and/or separate IP subnets, it is sometimes useful for a server to have a presence on more than one VLAN simultaneously. Gigabit Ethernet NICs support multiple VLANs on a per-port or per-interface basis, allowing flexible network configurations.

NOTE: VLAN tagging is required to be enabled only on switch ports that create trunk links to other switches, or on ports connected to tag-capable end-stations, such as servers or workstations with 3Com NICs.

VLAN Support

Virtual Local Area Networks (VLANs) are commonly used to split up groups of network users into manageable broadcast domains, to create logical segmentation of workgroups, and to enforce security policies among logical segments.
Each Team supports up to 64 VLANs. Note that only 3Com NICs and Alteon AceNIC NICs can be part of a team with VLANs. With multiple VLANs on a NIC, a server with a single NIC can have a logical presence on multiple IP subnets. With multiple VLANs in a team, a server can have a logical presence on multiple IP subnets and benefit from load balancing and failover.

NOTE: NICs that are members of a failover team can also be configured to support VLANs. Because VLANs are not supported for an Intel LOM if a LOM is a member of a failover team, VLANs cannot be configured for that team.

Adaptive Interrupt Frequency

The NIC driver intelligently adjusts host interrupt frequency based on traffic conditions, to increase overall application throughput. When traffic is light, the NIC driver interrupts the host for each received packet, minimizing latency. When traffic is heavy, the NIC issues one host interrupt for multiple, back-to-back incoming packets, preserving host CPU cycles.

Dual DMA Channels

The PCI interface on the Gigabit Ethernet NIC contains two independent DMA channels for simultaneous read and write operations.

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32-bit or 64-bit PCI Bus Master

The PCI Interface on the Gigabit Ethernet NIC complies with PCI Local Bus Rev 2.2, is compatible with both 32-bit and 64-bit PCI buses. As a bus master, the NIC requests access to the PCI bus, instead of waiting to be polled.

ASIC with Embedded RISC Processor

The core control for the Gigabit Ethernet NIC resides in a tightly integrated, high-performance ASIC. The ASIC includes dual RISC processors. This provides the flexibility to add new features to the card and adapt it to future network requirements via software download. This also enables the NIC drivers to exploit the built-in host off-load functions on the NIC as host operating systems are enhanced to take advantage of these functions.

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B Installing and Using the Managed PC Boot Agent

Booting From the Network

This section explains how to use the Managed PC Boot Agent (MBA) to boot from the network.

NOTE: For detailed information on using, configuring, and troubleshooting the MBA, see the *Managed PC Boot Agent User Guide*, located with the MBA software on the *3Com Installation CD*.

MBA allows the PC to boot from the server rather than from its local hard drive. MBA is compliant with the Wired for Management, Preboot Execution Environment (PXE) specification.

Using the Boot ROM on the NIC to Boot from the Network

The boot process for the MBA boot ROM varies depending on the type of PC you have (BBS BIOS-compatible or non-BBS BIOS-compatible).

If your PC was purchased recently, it may be BBS (BIOS Boot Specification) BIOS-compatible. The BBS determines how the system BIOS identifies boot devices in a PC (such as a CD-ROM drive, a hard drive, or a floppy drive), allows the user to select the boot order of these devices, and then attempts to boot from each device in the specified order.

Refer to your PC documentation if you do not know which type of PC you have.

BBS BIOS-Compatible PCs

To enable a BBS BIOS-compatible PC to boot from the network using the MBA boot ROM:

1. Make sure that the NIC boot ROM setting is *Enabled*.
   See on page 106 for instructions.
2. Set the MBA manually as the first boot device in the PC BIOS.
   Refer to your PC documentation for instructions on accessing and configuring the PC BIOS.
3. Reboot the PC.
   The MBA attempts to boot from the network using the default boot method PXE.
   To change the default method or any other MBA configurations, press *Ctrl* + *Alt* + *B* when the following message appears:
   ```
   Initializing MBA. Press Ctrl+Alt+B to configure...
   ```
   If the network boot fails, the following message appears:
   ```
   Network boot aborted, press any key to continue
   ```
   The BIOS continues to the next device in the boot order (for example, the local hard drive).

NOTE: To cancel the network boot, press *Esc* anytime during the network boot process.

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Non-BBS BIOS-Compatible PCs

To enable a non-BBS BIOS-compatible PC to boot from the network using the MBA boot ROM:

1. Make sure that the NIC boot ROM setting is *Enabled*.

   See " " on page 106 for instructions.

2. Change the MBA default boot setting from *Local* to *Network*.

   To change the default boot setting or any other MBA configurations, use the MBACFG utility located on the MBA utility diskette or press Ctrl+Alt+B when the following message appears:

   ```
   Initializing MBA. Press Ctrl+Alt+B to configure...
   ```

NOTE: For more information on using, configuring, and troubleshooting the MBA boot ROM, see the *Managed PC Boot Agent User Guide*, located with the MBA software on the *Installation CD*.

Enabling or Disabling the Boot ROM Setting

To enable the boot ROM setting on the NIC:

1. Run b57util.exe from the \dos\utility directory in the *3Com Installation CD*.
2. Enter:
   `run b57util pxee <devnum>`
   where <devnum> represents the NIC device number (entering **`all`** affects all supported NICs on the network).

To view all command options for this utility, enter:
`run b57util help`.

To disable the boot ROM setting on the NIC:

1. Run b57util.exe from the \dos\utility directory in the *3Com Installation CD*.
2. Enter:
   `run b57util pxed <devnum>`
   where <devnum> represents the NIC device number (entering **`all`** affects all supported NICs on the network).

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C Specifications

10/100/1000 BASE-T Cable Specifications

Port Type	Connector	Media	Maximum Distance
10BASE-T	RJ-45	Cat. 3, 4, or 5 UTP	100 meters (325 ft)
100/1000BASE-T	RJ-45	Cat. 5 UTP	100 meters (325 ft)

NOTE: 1000BASE-T signaling requires four twisted pairs of Category 5 balanced cabling, as specified in ISO/IEC 11801:1995 and ANSI/EIA/TIA-568-A (1995) and tested for additional performance using testing procedures defined in TIA/EIA TSB95.

Performance Specifications

Feature	Specification
PC-X clock	133 MHz max
PCI clock	66 MHz max
PCI Data/Address	32 bit and 64 bit
PCI data burst transfer rate	132 Mbps (32-bit bus) 264 Mbps (64-bit bus) 528 Mbps (64-bit bus at 66 MHz)
PCI modes	Master/slave
10/100/1000BASE-T	10/100/1000 Mbps (full duplex)

Physical Characteristics

Dimension	Measurement
Length	17.3 cm (6.8 in.)
Width	6.4 cm (2.5 in.)

Power Requirements

Specification	Measurement
Operating voltage	+5 V ± 5%
Power consumption	10 Watts 2 A @ +5 VDC

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Environmental Specifications

Condition	Operating Specification	Storage Specification
Temperature	0°C to 55°C (+32°F to +131°F)	–40°C to +85°C (–40°F to +185°F)
Relative humidity	5% to 85% (non-condensing) 40°C, 16 hour dwells at extremes	5% to 95% (non-condensing) 10°C/hour
Altitude	Up to 10,000 ft.	Up to 35,000 ft.
Shock	10g, 1/2 sine wave, 11 msec	60g, 1/2 sine wave, 11 msec
Vibration, peak to peak displacement	0.005 in. max (5 to 32 Hz)	0.1 in. max (5 to 17 Hz)
Vibration, peak acceleration	0.25g (5 to 500 Hz) (Sweep Rate = 1 octave/min.)	0.25g (5 to 500 Hz) (Sweep Rate = 1 octave/min.)

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D Technical Support

3Com provides easy access to technical support information through a variety of services. This appendix describes these services.

Information contained in this appendix is correct at time of publication. For the very latest, 3Com recommends that you access the 3Com Corporation World Wide Web site.

Online Technical Services

3Com offers worldwide product support 24 hours a day, 7 days a week, through the following online systems:

- 3Com Web site
- 3Com KnowledgeBase Services
- 3Com FTP site

World Wide Web Site

Access the latest networking information on the 3Com Corporation World Web site by entering the URL into your Internet browser:

http://3com.com/

This service provides access to online support information such as technical documentation and software library, as well as support options ranging from technical education to maintenance and professional services.

3Com KnowledgeBase Services

The 3Com KnowledgeBase is a database of technical information designed to help you diagnose and solve any problems you may be having with the installation, upgrade, and configuration of 3Com products. The KnowledgeBase is updated daily with technical information discovered by 3Com technical support engineers. This complementary service is accessible around-the-clock to 3Com customers and partners, and is located on the World Wide Web at:

http://knowledgebase.3com.com

3Com FTP Site

Download drivers, patches, software, and MIBs across the Internet from the 3Com public FTP site. This service is available 24 hours a day, 7 days a week.

To connect to the 3Com FTP site, enter the following information into your FTP client:

- Hostname: **ftp.3com.com (or 192.156.136.12)**
- Username: **anonymous**
- Password: **<your Internet e-mail address>**

NOTE: A user name and password are not needed with Web browser software such as Netscape Navigator and Internet Explorer.

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Support from Your Network Supplier

If additional assistance is required, contact your network supplier. Many suppliers are authorized 3Com service partners who are qualified to provide a variety of services, including network planning, installation, hardware maintenance, application training, and support services.

When you contact your network supplier for assistance, have the following information ready:

- Product model name, part number, and serial number
- A list of system hardware and software, including revision levels
- Diagnostic error messages
- Details about recent configuration changes, if applicable

If you are unable to contact your network supplier, see the following section on how to contact 3Com.

Support from 3Com

If you are unable to obtain assistance from the 3Com online technical resources or from your network supplier, 3Com offers technical telephone support services. To find out more about your support options, please call the 3Com technical telephone support phone number at the location nearest you.

When you contact 3Com for assistance, have the following information ready:

- Product model name, part number, and serial number
- A list of system hardware and software, including revision levels
- Diagnostic error messages
- Details about recent configuration changes, if applicable

Below is a list of worldwide technical telephone support numbers:

Country	Telephone Number
Asia Pacific Rim	
Australia	1 800 678 515
Hong Kong	800 933 486
India	+61 2 9937 5085
Indonesia	001 800 61 009
Japan	0031 61 6439
Malaysia	1800 801 777
New Zealand	0800 446 398
Pakistan	+61 2 9937 5085
Philippines	1235 61 266 2602
P.R. of China	10800 61 00137 or 021 6350 1590
Singapore	800 6161 463
S. Korea	
From anywhere in S. Korea:	
From Seoul:	00798 611 2230
Taiwan, R.O.C.	(0)2 3455 6455
Thailand	0080 611 261
	001 800 611 2000
Europe	
From anywhere in Europe, call:	+31 (0)30 6029900 phone
	+31 (0)30 6029999 fax

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Country	Telephone Number
From the following countries, you may use the toll-free numbers:	
Austria	0800 293025
Belgium	0800 778353
Denmark	8088 33 25
Finland	0800 1 18387
France	0800 91 7736
Germany	0800 100 0427
Hungary	06800 14370
Ireland	1800 509017
Israel	1800 9431983
Italy	800 780557
Luxembourg	800 29727
Netherlands	0800 023 0245
Norway	800 1 0767
Poland	00 800 4411 349
Portugal	800 844 029
South Africa	0800 995014
Spain	900 95 8966
Sweden	020 796980
Switzerland	0800 835283
U.K.	0800 085 1816
Latin America	
Argentina	AT&T +800 666 5065
Brazil	0800 13 3266
Chile	1230 020 0645
Colombia	98012 2127
Mexico	01 800 CARE (01 800 2273)
Peru	AT&T +800 666 5065
Puerto Rico	800 666 5065
Venezuela	AT&T +800 666 5065
North America	1-800-527-8677

Returning Products for Repair

Before you send a product directly to 3Com for repair, you must first obtain a Return Materials Authorization (RMA) number. Products sent to 3Com without RMA numbers will be returned to the sender unopened, at the sender's expense.

To obtain an RMA number, call or fax:

Country	Telephone Number	Fax Number
Asia, Pacific Rim	+65 543 6500	+65 543 6348
Europe, South Africa, and Middle East	+31 30 6029900	+31 30 6029999
From the following European countries, you may call the toll-free numbers; select option 2 and then option 2:		

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Country	Telephone Number	Fax Number
Austria	0800 297468	
Belgium	0800 71429	
Denmark	800 17309	
Finland	0800 113153	
France	0800 917959	
Germany	0800 1821502	
Hungary	00800 12813	
Ireland	1800553117	
Israel	1800 9453794	
Italy	1678 79489	
Netherlands	0800 0227788	
Norway	800 11376	
Poland	00800 3111206	
Portugal	0800 831416	
South Africa	0800 995014	
Spain	900 983125	
Sweden	020 795482	
Switzerland	0800 55 3072	
U.K.	0800 966197	
Latin America	1 408 326 2927	
U.S.A. and Canada	1-800-527-8677	

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Regulatory Information

FCC Class A Verification Statement

WARNING: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules, and the Canadian Department of Communications Equipment Standards entitled, "Digital Apparatus," ICES-003. These limits are designed to provide reasonable protection against harmful interference in a commercial installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference, in which case, the user will be required to correct the interference at the user's own expense.

Changes or modifications not expressly approved by 3Com could void the user's authority to operate this equipment.

FCC Class B Statement

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference, and
2. This device must accept any interference received, including interference that may cause undesired operation.

WARNING: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules, and the Canadian Department of Communications Equipment Standards entitled, "Digital Apparatus," ICES-003.These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from the one which the receiver is connected to.
- Consult the dealer or an experienced radio/TV technician for help.

The user may find the following booklet prepared by the Federal Communications Commission helpful:

The Interference Handbook

This booklet is available from the U.S. Government Printing Office, Washington, D.C. 20402. Stock No. 004-000-00345-4.

NOTE: In order to maintain compliance with the limits of a Class B digital device, 3Com requires that you use quality interface cables when connecting to this device. Changes or modifications not expressly approved by 3Com could void the user's authority to operate this equipment. Refer to the manual for specifications on cabling types.

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FCC Declaration of Conformity

We declare under our sole responsibility that the

Model:	Description:
3C996B-T	Gigabit Server NIC (Ethernet)
3C996-SX	Gigabit Server NIC (Fiber)

to which this declaration relates, are in conformity with the following standards or other normative documents:

- ANSI C63.4-1992 Methods of Measurement

Federal Communications Commission 47 CFR Part 15, subpart B
3Com Corporation, 5400 Bayfront Plaza, P.O. Box 58145, Santa Clara, CA 95052-8145

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